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AUTHOR Gustman, Alan L.; Segal, Martin
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ABSTRACT

This study examines the impact of teachers' organizations on the compensation of public school teachers. Part 1 focuses on the impact of collective bargaining on teachers' salaries; part 2 deals with interstate variations in teachers' pensions and the influence of teachers' organizations on these variations. In part 1, the authors estimate the impact of collective bargaining through regression analysis of factors other than unions that affect teachers' salaries. Findings indicate that the impact of collective bargaining on salaries is in the 0-5 percent range, and that collective bargaining reduces the number of steps in the BA and MA tracks. Part 2 derives an interstate index of pension benefits based on data for 39 states. Regression analysis is used to explain interstate variations in pension benefits and employee contributions. Findings indicate that teachers' organizations have successfully increased pensions for teachers with 25 years service, but have had little impact on pensions for teachers with longer service. (Author/JG)

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Final Report

The Impact of Teachers' Unions

National Institute of Education Project No. 4-0136

Alan L. Gustman and Martin Segal

Dartmouth College

Hanover, New Hampshire

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ABSTRACT

This study is concerned with the impact of teachers' organizations on the compensation of public school teachers. In the first part of the study we examine the impact of collective bargaining on teachers' salaries; in the second part we deal with interstate variations in teachers' pensions and with the role of teachers' organizations as an influence on these variations.

Our analysis suggests that we should not limit the study to a single salary measure but examine the impact of collective bargaining on a number of measures and on several aspects of teachers' salary structure. We estimate the impact of collective bargaining in a series of regressions in which we standardize for the influence of factors, other than unions, that affect teachers' salaries. The findings appear to confirm the expectations outlined in our discussion of the factors shaping union policies: the impact of collective bargaining is focused on the remuneration received by experienced teachers with an MA degree. The size of the impact on various salary measures is consistent with the findings of previous studies, i.e. 0-5% of the levels of particular salaries. Our findings indicate also that collective bargaining reduces the number of salary steps in the BA and MA educational tracks.

In part two we derive an interstate index of pension benefits for teachers by applying state pension formulas to average salaries of teachers in each of the 39 states for which appropriate data are available. We also compute an interstate index of employee contributions to state pension funds. We then estimate regressions which are expected to explain interstate variations in pension benefits for retired teachers and in employee contribution. The results indicate that teachers organizations, active in lobbying in state legislatures, have been successful in increasing considerably the pensions of those teachers who retire after 25 years of service: the organizations have had, however, little impact on the pensions of teachers who have accumulated long periods of service, i.e. those whose pensions computed on the basis of state formulas, would approach the levels of their final salaries.

INTRODUCTION

The purpose of this study is to examine the effect of unionism--as exemplified by the activities of either the local organizations of the National Education Association or of the American Federation of Teachers--on the compensation of public school teachers. The term compensation has, of course, many component payments, including a variety of possible fringe benefits. We will deal only with the most important of these components--salaries and pensions. Teachers' organizations influence salaries primarily through collective bargaining with local school boards. In the first part of this study we will analyze the effects of such collective bargaining on the levels of teachers' salaries and on the structural relationships of the various measures of these salaries. In the second part of the study we will deal with pensions--i.e. with both retirement benefits of teachers and with the contribution that teachers have to make toward such benefits. More specifically, we will analyze the determinants of interstate variations in pensions and contributions, and in the course of that analysis we will try to measure the impact exerted by the state organizations of teachers.

PART ONE

Collective Bargaining and Teachers' Salaries

I

The present study, its analytical approach and its results, may be best viewed in the context of the findings of other studies of the impact of unionism on salaries of public school teachers. The common finding of these studies is that, ceteris paribus, salaries received by teachers who are represented in collective bargaining by a union (or a teacher organization acting, in effect, as a union) are not very much higher than the salaries of teachers who are not working under a collective bargaining agreement. Teachers' salaries have been measured in these studies in a number of ways--by average salary of all teachers in a school district, starting salaries (i.e. for those with a BA degree and no experience), by minimum and maximum salaries paid to those with different levels of formal education; we will discuss these measures and their relationship in greater detail later on. But it is useful from the viewpoint of our immediate discussion of the other studies to consider here briefly the question of what measure of salaries should be used in a study of the impact of unions.

A major reason why different studies used different measure is that, in fact, there is no obvious "best" way

to measure salaries of public school teachers. Teacher salary schedules vary from one school district to another in a number of ways but they all prescribe salaries that differ--within a given district--in accordance with formal training and experience. The renumeration called for by a given salary schedule is likely thus to differ among individual teachers. Moreover some aspects of a given schedule are likely to be of greatest importance to the teachers, i.e. the supply side of the market while other aspects will be of paramount interest to the school board, i.e. the demand side.

From the point of view of the school board, the measure of salaries that is most relevant for determining current cost is presumably average salary. But, given an education-experience composition of the teachers' work force, average salary and current costs depend, of course, on the salary schedules and the relation of the various salaries, i.e. their structure. A school board is also likely to be very much aware that changes in salary schedules and structure will have implications not only for current but also for future costs. Moreover, depending on a labor market situation or a time period, a school board may be particularly concerned about special components or features of a salary structure. For example in times of expansion and increased recruitment a board may consider starting

salaries to be of overriding importance. At other times a board may feel great pressure to adjust the salaries of teachers who have accumulated some experience in the particular school district.

On the supply side teachers who are firmly committed to teaching and perhaps to teaching in their current school district may treat the salary schedule as a basis for projecting their lifetime earnings. The more committed teachers are also likely to have the greatest influence on union salary policy. In contrast, new teachers who are not firmly committed to teaching, or who expect to interrupt their teacher careers may have a very short planning horizon and little leverage on union policy. These teachers may pay almost exclusive attention to starting and early year salaries. They may view the salary schedule of a district from the same perspective they would have viewed the internal wage structure for any job, that is, as a schedule that prescribes skill differentials relevant to their occupation, but not necessarily the future course of their earnings.

As these preliminary considerations suggest, neither market forces nor teachers' organizations negotiating a contract are likely to affect in a uniform manner all the components or features of teachers salary schedules and structures. The implication thus is that a study of the impact of collective bargaining should consider not

one salary measure but rather several such measures. One of our own purposes will be, indeed, to spell the kind of impact that collective bargaining has on each of the major components and features of salary schedules of public school teachers.

II

As a background for our discussion we shall consider in this section a few of the more important and representative studies of the impact of teachers' unions on salaries. Most of these studies are essentially empirical in nature, attempting to measure the extent of such an impact. A study by Wellington and Winter is an exception.[1] That study is concerned with an analysis of the relative strength of unions in the public sector--including, of course, teachers' organizations--as compared with that in the private sector, and with the various issues of public policy stemming from the special position of public sector unions.

In Wellington and Winter's view there are several reasons why public employee unions--such as teachers' organizations bargaining with a local authority--can be expected to have more market power than a typical union in the private sector: inelastic demand for government services; absence of profit motive on the part of the "management"; the fact that the public does not see clearly

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[1] H. H. Wellington and R. K. Winter Jr. The Unions and the Cities, Washington, D.C. 1971. As the title suggests the volume deals primarily with organizations of municipal or local government employees.

a relation between local budget increases resulting from union gains and increases in taxes; political pressures on the mayor or other officials to stop a strike that causes inconvenience; and others. The overall implication of the Winter and Wellington study is that, in the absence of special policy measures, public sector unions could be expected to make salary or wage gains well above those made typically by labor organizations presumably restrained by the market forces of the private sector of the economy.

While much of the evidence cited by Wellington and Winter is essentially of an ad hoc nature, they do provide a thorough and insightful analysis of the economic and political aspects of collective bargaining by public employees--an analysis very much relevant to a study of the impact of teachers' unions. But the hypotheses which they set forth with respect to the determinants of relative union strength have yet to be tested on a systematic basis.[2]

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[2]Some of the crucial points of Wellington and Winter's analysis--e.g. those pertaining to the relative absence of market restraints in the public sector or to the political pressures to stop public sector studies--have been challenged by other students, particularly Burton and Krider. (See J. F. Burton Jr. and C. Krider, "The Role and Consequences of Strikes by Public Employees," Yale Law Journal, January (1970).)

The other major studies to be considered here deal specifically with teachers' salaries and the way they have been affected by collective bargaining. The data and variables employed in each of these studies are summarized in Table 1. It can be seen from the table that these studies differ from one another both in terms of the population which underlies the data sample and in terms of the specification of the teachers' salary equation. From the published results alone it is not possible to tell whether differences in the findings of the various studies, where they exist, are due to differences in the underlieing populations or to differences in methodology.

The article by Kasper is the earliest of the six papers.[3] His findings seem to indicate that teachers' unions have only a weak effect on teachers' salaries. Specifically, his best estimates suggest a union impact on teachers' salaries of about four percent. A major weakness of this study is a poor specification of the wage equation. As Schmenner has pointed out, one independent variable

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[3]H. Kasper, "The Impact of Collective Bargaining on Public School Teachers," Industrial and Labor Relations Review, October 1970, pp. 57-72.

in this equation is the amount of spending per student.[4] This variable is, of course, very strongly influenced by the dependent variable in the wage equation, teachers' salaries. Thus is should, at least, be treated as an endogenous variable. More importantly, it appears that total spending per student should not be included at all as an independent variable in a reduced form wage equation.[5]

Another relatively early study was that of R. J. Thornton.[6] Although Thornton specifies supply and demand separately, he assumes that the demand curve for teachers is perfectly inelastic. This simplifies his analysis considerably by allowing him to avoid the problems that stem from the simultaneous interaction of the supply and demand. If this assumption is incorrect, his results will be subject to specification error.

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[4] R. W. Schmenner, "The Determinants of Municipal Employee Wages," Review of Economics and Statistics, February 1973, pp. 83-90.

[5] See for instance the derivation of the wage equation in M. O. Clement and A. L. Gustman, Factor Cost Differences Educational Equality and Funding Decisions in Public Education. Project No. 2-0681, National Institute of Education pp. 20-21.

[6] R. J. Thornton, "The Effects of Collective Negotiations on Relative Teachers' Salaries," Review of Economics and Business, Winter 1971, pp. 37-46.

Thornton's finding as to the size of the union impact on the base pay of teachers is not far from Kasper's. He estimates the impact to be about two percent. His results also indicate a large (twenty-three percent) impact of unions on the maximum salary paid to those teachers who have earned a Masters Degree. However, it should be noted that this last finding is based on a regression where the R^2 is .07, while the comparable R^2s for other of Thornton's regressions are in the neighborhood of .50. The implication, which Thornton recognizes, is that this estimate of the effect of unions on the maximum salary for those with a Masters Degree may not be totally reliable.

In a comment on Kasper's article, Baird and Landon added a new dimension to the analysis.[7] In their empirical estimates they include as an independent variable the number of school districts in the same county as the observed school district. This variable is meant to standardize for the effects of differences in the degree of monopsony

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[7] R. N. Baird and J. H. Landon, "The Effect of Collective Bargaining on Public School Teachers' Salaries--Comment," Industrial and Labor Relations Review, April 1972 pp. 410-17. See also "Reply" by H. Kasper in the same issue.

Table 1: DATA AND VARIABLES EMPLOYED IN VARIOUS STUDIES OF TEACHERS UNIONS

AUTHOR	TYPE OF DATA	WAGE VARIABLE	INCOME VARIABLE	ALTERNATIVE OCCUPATION OR OTHER EMPLOYMENT CONSIDERED	PROPERTY VARIABLE
Kasper	State data 1966-67	Average teacher salary (statewide)	State per capita income		
Thornton	83 districts in large cities (pop. 100,000 and over)	Minimum and Maximum salaries for BA and MA degree holding teachers		Average level of wages and salaries in the city for all employees	
Landon and Baird	44 districts enrollment size 25,000 to 50,000	Entry salary (min. for BA with no experience)	Per capita income		Effective property tax rate
Hall and Carroll	118 elem. school districts in suburban Cook County	Average teacher salary	Med. family income	% White collar	
Schmenner	11 large cities years 1962-1970	Entry salary (min. for BA with no experience)		Office clerical employees	Property assessment per capita % Δ in prop. tax rate
Frey	298 districts in New Jersey, 1964 to 1970	Entry salary (base pay for BA teachers, with no experience)	Med. family income	Industrial nurses	

Table 1 (Continued)

AUTHOR	REVENUE&/OR EXPENDITURE VARIABLES	UNIONIZATION VARIABLES	TEACHER CHARACTERISTICS VARIABLES	OTHER VARIABLES
Kasper	% revenue from Fed % revenue from State % revenue from Local Current Exp./ pupil	% teachers represented % districts with representation % of formal agreements	% teachers with substandard certificates % elemen. teachers	% urban dummy for Western states
Thornton		Dummy variable, measure whether district had negotiated agreement with a recognized teacher's organization	Percent of Teachers with less than standard teaching certificates	District Size Pupil/Teacher Ratio
Landon and Baird	% revenue from local sources	Dummy: Collective Negotiations? % NEA % AFT		# of districts in the county of district in question
Hall and Carroll	State aid/ pupil as a % of expend per pupil (operating expenditures)	Dummy: existence of a collective bargaining agreement	% Male teachers mean yrs. experience of teachers	Average daily Attendance In another equation also % urban, population, and pupil/teacher ratio
Schmenner		Collective bargaining dummy # work stoppages per area employee		City population to metro. area population school district dummy (independent or dependent)
Frey	State aid (total & equalized portion) considered & rejected	Collective Bargaining dummy		Average Daily Attendance (proxy for pleasantness or unpleasantness of work)

power on the part of school boards. The presumption here is, as noted by Kasper, that the scope of the market coincides with the geographical boundaries of the county. In the Baird and Landon study, union impact is estimated to be about five percent and is thus in close agreement with Kasper's findings.[8]

In their study of elementary school districts in Cook County, Illinois Hall and Carroll introduced another innovation.[9] The methodologic innovation in that study involves the treatment of class size as an independent variable which is determined simultaneously with teachers' salaries. Both teachers' salaries and class size are said to be influenced by unions.

The findings of these authors are somewhat curious. Their estimates indicate that unions have a positive effect on both salaries and class size. The implication is that

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[8]However, Thornton's calculations--applied to his own sample of districts--showed no significant relation between the "degree of monopsony," as measured by Baird and Landon, and teachers' salaries. See R. J. Thornton, "Monopsony and Teachers' Salaries: Some Contrary Evidence," Industrial and Labor Relations Review, July 1975, pp. 574-75, and "Reply" by Baird and Landon in the same issue.

[9]W. C. Hall and N. E. Carroll, "The Effects of Teachers' Organizations on Salaries and Class Size," Industrial and Labor Relations Review, January 1973, pp. 834-41.

unions trade for higher salaries by accepting larger classes. (This implication is, of course, inconsistent with Thornton's assumption of an inelastic demand curve for teachers). What is most puzzling about their findings is that the increase in class size due to unions lowers costs by more than the union impact on salaries raises costs. That is, the net effect of unions is to lower the cost of education. While one could try to rationalize these results, they do seem to suggest that the union variable in either the wage or class size equation may be picking up some unmeasured characteristics that are operating in communities where unions have negotiated a collective bargaining agreement in such a way as to affect systematically the negotiated salaries or class size.

The empirical studies reviewed so far base their estimates on cross-section data for a particular period. In his article, Schmenner utilizes pooled cross-section time series data for eleven cities from 1962 to 1970.[10] For this sample of very large cities, Schmenner found a union impact of between twelve and fourteen percent.

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[10] R. W. Schmenner, "The Determination of Municipal Employee Wages, op. cit.

A major weakness of Schmenner's study appears to be a failure to control adequately for the effects of growing student enrollment on the demand for teachers throughout the period covered by his analysis. The only variable included which might reflect some of the growth in demand is a measure of the change in the property tax rate in each city. Since the enrollment growth throughout the 1960's corresponded with the growth in unionization, any effects of growing demand for teachers on teachers' salaries that are not fully reflected in the local tax rate may lead to an upward bias in the estimated effect of unionization on teachers' salaries. Such a bias might, at least in part, account for the fact that Schmenner's findings indicate a much stronger effect of unions on teachers' salaries than do the other studies reviewed here.

The last study summarized in Table 1 is by Donald Frey.[11] Frey finds only a weak (less than two percent) impact of collective bargaining on wages, even after allowing for

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[11] The summary is based on D. E. Frey "Wage Determination in Public Schools and the Effects of Unionization" in D. S. Hamermesh ed. Labor in the Public and Nonprofit Sectors, Princeton, 1975 and on D. E. Frey, "Wage and Employment Effects of Collective Bargaining in Public Schools in New Jersey," Unpublished Ph.D. Dissertation, 1972, Princeton University.

interaction effects between the union variable and all other variables included in the wage equation. While this finding is consistent with those of most of the studies discussed above, it remains subject to some questions. The reason is that Frey's estimates of an employment equation, which along with the teacher salary equation is a basic element of his model, are perverse and apparently inconsistent with his theoretical analysis. Specifically, his results indicate that in those districts where the opportunity cost of teachers is high, the school board will have a tendency to hire more teachers.

In addition to the authors mentioned in Table 1, there have been also other students that have pursued the subject of the impact of unions on teachers' salaries. But while the data and the methods used by these students differ, the results appear to be pretty much the same as those of the major studies summarized above.[12] We should take, however, special notice of a study by G. Moore that focused

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[12]See, for example, D. B. Lipsky and J. E. Drothing "The Influence of Collective Bargaining on Teachers' Salaries in New York State," Industrial and Labor Relations Review, October 1973; E. F. Kirk, A Theoretical and Empirical Study of the Impact of Collective Negotiations on Public School Teachers' Salaries in the Commonwealth of Massachusetts, unpublished Ph.D. Dissertation, Boston College, 1974.

on an aspect of teachers' salaries not examined in previous research.[13] Moore examined the impact of collective bargaining on the salary differential between elementary and secondary school teachers in 201 school districts of Nebraska. His results indicate that collective bargaining reduced such a differential by an amount equal to about 6% of an average teacher salary in the state. In view of the wide prevalence of single salary schedules, i.e. schedules instituting internal salary differences only on the basis of educational attainment or experience--the of a union impact described by Moore is not likely to be found in many school districts. The more important contribution of the study is probably the fact that it calls attention to the possible influences of collective bargaining on the structure, as distinct from levels, of teachers' salaries.

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[13] G. A. Moore, "The Effect of Collective Bargaining on Internal Salary Structures in the Public Schools," Industrial and Labor Relations Review, April 1976.

III

Teacher's organizations have been formally recognized for purposes of bargaining only since 1960.[14] But on a less formal basis these organizations have influenced teachers' salaries for decades. In particular, the National Education Association played an important role in fostering what, by the end of World War II, was the virtual nationwide adoption of the single salary schedule. As a result, with rare exception, within school districts teachers' salaries differ for only two reasons--differences in formal education and differences in experience.[15]

While the salary schedules adopted by different school districts have the same general structure, the specific

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[14] In 1960, the United Federation of Teachers (UFT) was recognized as the bargaining agent for New York City Public school teachers.

[15] The economic implications of the single salary schedule and the history of its adoption are discussed in Joseph A. Kershaw and Ronald N. McKean, Teacher Shortages and Salary Schedules, McGrawHill, New York 1962. It should be noted that out of a group of sampled school districts with over 6000 students five percent reported provisions for pay differentials to be based on merits. But these differentials are minor compared to differentials for experience and formal training. And no school district with over 100,000 students reported that it provides extra pay for meritorious service. (National Education Association, Salary Schedules and Fringe Benefits for Teachers, 1972-73: Washington, D.C. 1973, p. 26).

details may vary considerably. As a first step in our study of the impact of unions on salaries and their structure, we examine the basic features of the single salary schedule. We then describe the ways in which specific features of these schedules differ among school districts.

The salary schedules typically consist of a number of tracks, with each track representing a level of formal training. The tracks are, in turn, divided into steps. An individual normally progresses one step for each additional year of experience up to some maximum number, after which number pay no longer increases with experience.[16] All tracks within the schedule of a district need not have an identical number of steps. Usually, if there are differences in the number of steps, there will be more steps in the tracks requiring the higher levels of formal training.

The schedules used by different school districts may differ in a number of respects. There may be differences in starting salary, the number of tracks, the additional pay associated with a given track, the number of steps within a given track, and the average size of each step.

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[16]We should take note of the fact that in about one quarter of the school districts with over 6,000 students sampled by the NEA, provision for long service increments beyond regularly scheduled maximums have been adopted. National Education Association, Salary Schedules and Fringe Benefits in Teachers, 1972-73, op. cit., p. 25.

As a result of all of these, the maximum pay by level of formal education will also vary among districts.

Two sets of data pertaining to the various dimensions of teachers' salary schedules are examined below. In one set average characteristics of the salary schedules for a sample of school districts with enrollments of over 6,000 students are reported. The other set consists of data pertaining to the various features of the salary schedules adopted by 93 central city school districts which are part of the largest SMSA's in the country. The data for the 93 large districts will form the basis for our empirical study of the impact of teachers' unions on teachers' salaries.[17]

In Tables 2 and 3 data for samples of school districts with over 6,000 students enrolled are reproduced from an NEA study. These data span the ten year period from 1962-63 to 1972-73. Before attempting to interpret the data, a word of warning is called for. The composition of the sample of school districts varies from one year to the next. Therefore, more than normal care should be exercised when examining the data for any apparent trends. This is particularly so when examining data for those with training

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[17]The list of these districts is in Appendix A.

beyond the masters degree. Since relatively few teachers have attained such high levels of formal education many districts do not have a formal salary track beyond the one for those with a master's degree. In particular, in 1972-73, the salary schedules of only half of the sampled school districts with over 5,000 students included in a separate track for those with an earned doctorate.[18]

From the data reported in Tables 2 and 3 it can be seen that over the past decade, the average values of the minimum and maximum salaries scheduled for those in each track have been characterized by strong upward trends. The index numbers reported in Table 3 indicate, however, that there are some differences in the rates of growth for each of the scheduled salaries. For one thing, the salaries paid to those with a BA degree or with an MA degree plus thirty credits (6 years of schooling) have grown more slowly than have salaries paid to those with either an MA or a Ph.D. degree. For another, it can be seen that the differences

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[18]Our analysis of the impact of collective bargaining on teachers' salaries will be, in fact, limited to the effects salaries and salary structure of those with a BA or an MA degree. The salaries of teachers with education beyond the master's degree are excluded from our study. One reason is that, as noted above, many school districts do not have formal salary schedules for such teachers. Moreover the number of teachers with training exceeding an MA is relatively small.

Table 2

COMPARISON OF MEAN SCHEDULED SALARIES, 1962-63 THROUGH 1972-73

Preparation level and enrollment stratum	1962-63	1964-65	1965-66	1966-67	1967-68	1968-69	1969-70	1970-71	1971-72	1972-73
1	2	3	4	5	6	7	8	9	10	11
(enrollment 6,000 or more)										
Number of reporting systems*	557	1,063	1,071	1,104	1,080	1,199	1,142	1,176	1,179	1,240
Mean scheduled salary for:										
Bachelor's degree --Minimum	$4,331	$4,707	$4,925	$5,144	$ 5,522	$ 5,941	$ 6,383	$ 6,850	$ 7,061	$ 7,357
--Maximum	6,426	6,937	7,262	7,590	8,133	8,690	9,278	10,012	10,299	10,768
Master's degree --Minimum	4,680	5,085	5,350	5,600	6,043	6,546	7,058	7,599	7,837	8,176
--Maximum	7,054	7,723	8,167	8,578	9,248	9,981	10,717	11,630	11,973	12,563
Six years (M.A.+30) --Minimum	5,310	5,705	5,900	6,151	6,585	7,154	7,673	8,266	8,501	8,878
--Maximum	8,236	8,975	9,385	9,808	10,399	11,273	12,002	12,975	13,308	13,928
Doctor's degree† --Minimum	5,417	5,723	6,057	6,350	6,882	7,471	8,070	8,712	8,943	9,402
--Maximum	8,199	8,917	9,452	9,936	10,751	11,602	12,452	13,461	13,805	14,562

*Not all systems report all preparation levels.

†For earned doctor's degree or seven years of preparation.

Source: National Education Association, Salary Schedules and Fringe Benefits for Teachers, 1972-73, Research Report 1973-R2 1973.

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Table 3

COMPARISON OF MEAN SCHEDULED SALARIES, 1962-63 THROUGH 1972-73
Index 1962 = 100.0

Preparation level and enrollment stratum	School Year									
	1962-63	1964-65	1965-66	1966-67	1967-68	1968-69	1969-60	1960-71	1971-72	1972-73
(enrollment 6,000 or more)										
Number of reporting systems*	557	1,063	1,071	1,104	1,080	1,199	1,142	1,176	1,179	1,240
Mean scheduled salary for:										
Bachelor's degree --Minimum	100.0	108.7	113.7	118.8	127.5	137.2	147.4	158.2	163.0	169.9
--Maximum	100.0	108.0	113.0	118.1	126.6	135.2	144.4	155.8	160.3	167.6
Master's degree --Minimum	100.0	108.7	114.3	119.7	129.1	139.9	150.8	162.4	167.5	174.7
--Maximum	100.0	109.5	115.8	121.6	131.1	141.5	151.9	164.9	169.7	178.1
Six years (M.A.+30) --Minimum	100.0	107.4	111.1	115.8	124.0	134.7	144.5	155.7	160.1	167.2
--Maximum	100.0	109.0	114.0	119.1	126.3	136.9	145.7	157.5	161.6	169.1
Doctor's degree† --Minimum	100.0	105.6	111.8	117.2	127.0	137.9	149.0	160.8	165.1	173.6
--Maximum	100.0	108.8	115.3	121.2	131.1	141.5	151.9	164.2	168.4	177.6

*Not all systems report all preparation levels.

†For earned doctor's degree or seven years of preparation.

Source: Table 2

in rates of growth between the minimum and maximum salaries prescribed for those within each track are even smaller than are the corresponding differences between tracks. The relative differences between minimum and maximum salaries narrowed slightly for those in the BA track. For the other tracks the relative differences have been characterized by widening. In the cases of the MA and Ph.D. tracks, the increase in maximum salaries was 3 to 4 percent greater than was the increase in minimum salaries.

The picture of how salaries vary with experience and formal training (education) emerges upon examining the data in Table 4. Each figure in the table represents the average difference in salary scheduled for a person with the formal training and experience indicated in the first column of the table as compared to what salary would be for a person with the formal training and experience indicated in the first row. The average salary data for 1972-73 listed in column 11 of Table 2 were used to compute the dollar differences reported in Table 4.

The absolute differences in scheduled salaries for those with different levels of formal education and experience

have been expressed in percentage terms in Table 5.[19] The figures in the table indicate a number of things about the structure of salary schedules. For example, it can be seen from these data that relative difference between the maximum and minimum scheduled salaries for those with a given level of formal training--what may be called the salary spread within a salary track--is lower for those with a BA degree than it is for those with higher levels of formal training. Specifically, the relative difference between maximum and starting pay for those with a BA degree is 46 percent. The salary spreads for those with an MA degree plus 30 credits, and a Ph.D. are 54, 57 and 55 percent respectively.

The data in Table 5 also indicate that the differences in starting salary or in maximum salary that result from differences in formal education are smaller than are the differences between maximum and starting salaries for those with a given level of education. The starting salary for a person with an MA degree exceeds starting salary for a

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[19] Specifically, the indicated differences in a particular cell are equal to the ratio of the average salary indicated in the first column divided by the average salary indicated in the first row minus one, with the total multiplied by 100. The figures contained in Table 4 are, of course, not equal to the average of the corresponding ratios computed separately for the salary schedules by all school districts in the sample.

Table 4

Differences in Average Scheduled Salary by Level of Formal Training and Experience, 1972-73*

	BA-	BA+	MA-	MA+	(MA+30)-	(MA+30)+	Ph.D.-	Ph.D.+
BA-	0	-	-	-	-	-	-	-
BA+	3411	0	-	-	-	-	-	-
MA-	819	-2593	0	-	-	-	-	-
MA+	5206	1795	4387	0	-	-	-	-
(MA+30)-	1521	-1890	702	-3685	0	-	-	-
(MA+30)+	6571	3160	5752	1365	5050	0	-	-
Ph.D.-	2045	-1366	1226	-3161	524	-4526	0	-
Ph.D.+	7205	3794	6386	1999	5684	634	5160	0

*The figures in each cell are the dollar differences in scheduled salary between those with the formal training and experience indicated by the first column and those with the formal training and experience indicated in the first row.

BA- Salary for a teacher with a BA degree and no experience.
BA+ Maximum salary for a teacher with a BA degree.
MA- Salary for a teacher with an MA degree and no experience.
MA+ Maximum salary for a teacher with an MA degree.
(MA+30)- Salary for a teacher with 30 credits beyond the master's degree and no experience.
(MA+30)+ Maximum salary for a teacher with 30 credits beyond the master's degree.
(Ph.D.)- Salary for a teacher with a Ph.D. degree and no experience.
(Ph.D.)+ Maximum salary for a teacher with a Ph.D. degree.

Source: Data in Table 2, column 11.

Table 5

Percent Differences in Average Scheduled Salary * by Level of Formal Training and Experience, 1972-73

	BA-	BA+	MA-	MA+	(MA+30)-	(MA+30)+	Ph.D.-	Ph.D.+
BA-	0	-	-	-	-	-	-	-
BA+	46	0	-	-	-	-	-	-
MA-	11	-24	0	-	-	-	-	-
MA+	71	17	54	0	-	-	-	-
(MA+30)-	21	-18	9	-29	0	-	-	-
(MA+30)+	89	29	70	11	57	0	-	-
Ph.D.-	28	-13	15	-25	6	-33	0	-
Ph.D.+	98	35	78	16	64	5	55	0

* The figures in each cell are equal to the ratio of the scheduled salary for a person with the qualifications indicated in the first column to the salary scheduled for a person with the qualifications indicated in the first row, minus one, with the result multiplied by 100.

Source: Data in Table 2, column 11.

person with a BA degree by 11 percent. Having 30 credits beyond the MA raises starting salary on the average by nine percent above what a person with an MA could be paid. And earning a Ph.D. would raise starting salary by only an additional six percent. The comparable differences in maximum salary associated with the higher levels of formal training are 17, 11 and 5 percent respectively.

The fact that two districts have scheduled the same minimum and maximum salaries for a person with a given level of education does not mean that the schedules of the two districts will be viewed as equivalent to one another by a potential teacher applicant. To judge between the schedules, it would be important to know how quickly the maximum salary can be attained, i.e. how many steps are in the relevant track of the salary schedule. In 1972-73 the NEA reported that for school districts with over 6,000 students, the average number of steps in the BA, MA, MA+30 and Ph.D. tracks were 13, 13, 14 and 11 steps respectively.

The average scheduled salaries in the NEA sample of districts with over 6,000 students provide a point of reference to compare with the schedules in the 93 large city school districts that form the basis of our later empirical analysis.[20] Scheduled salaries for the two

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[20]The average enrollment in the 93 school districts used in our sample is 98000 students.

samples are compared in Table 6. A number of points can be made on the basis of the comparison. First, scheduled salaries are higher for the city sample than they are for the NEA sample. Second, the relative difference in maximum salaries is greater than is the comparable difference in starting salaries. This means that the spread between starting and maximum salaries within any track is greater for the districts in the city sample than it is for those in the NEA sample. Third, the difference between the samples in maximum salary paid to those with a BA degree is greater than is the comparable difference for those with an MA degree. What this means for a person with maximum experience is that the proportionate increase in salary paid for having earned a masters degree is less in the 93 city school districts than it is in the NEA sample districts.

Table 6

Comparison of Average Scheduled Salaries in 93 Central City School Districts and NEA Sample of Districts with Enrollment at Least 6,000: 1972-73

	(1) Average for 93 Districts	(2) Average for NEA Sample	(3) Dollar Difference	(4) Percent Difference
BA starting salary	$ 7,520	$ 7,357	$163	2.2%
BA maximum salary	11,475	10,768	707	6.6
MA starting salary	8,280	8,176	104	1.3
MA maximum salary	13,022	12,563	459	3.7

Source: National Education Association, Salary Schedules and Fringe Benefits for Teachers, 1972-73, op. cit.

The number of steps in the salary schedules may also be compared between the two samples. In the 93 large city school districts the average number of steps in the BA track is 11.4. In the MA track it is 12.6. For the NEA sample districts, the rounded average number of steps is 13 for both the BA and MA tracks.

Scheduled starting salaries, maximum salaries and the number of steps in each salary track vary considerably among school districts. It can be seen from the data in Table 7 that the scheduled maximum salaries vary relatively more than do the starting salaries. The greatest variation is in the number of steps scheduled within each of the tracks.

Table 7

DISPERSION OF SCHEDULED SALARIES AND NUMBER OF STEPS IN THE BA AND MA TRACKS OF 93 LARGE CITY SCHOOL DISTRICTS, 1972-73

	Mean	Standard Deviation	Coefficient Variation	High	Low	Range
BA starting salary	$ 7,520	$ 681	.091	9,571	6,000	3,471
BA maximum salary	11,475	1,630	.142	15,254	8,222	7,032
MA starting salary	8,280	767	.093	11,250	6,900	4,350
MA maximum salary	13,021	1,658	.127	16,600	9,162	7,438
No. steps--BA track	11.4	3.1	.272	24	4	20
No. steps--MA track	12.6	2.7	.214	25	7	18

Source: NEA, Salary Schedules and Fringe Benefit for Teachers, 1972-73, op. cit.

IV

The finding that there are differences in the relative variation of starting and maximum salaries reflects the fact that the structure of salary schedules varies from one district to the next. An implication is that the salary scheduled for a person with a given level of formal training and experience may not prove to be a useful index of the relative value of an entire salary schedule. For example, since two districts that offered the same starting salary might not schedule the same compensation for a teacher with a BA degree and ten years experience, it would be a mistake to label the schedules as equivalent based only on evidence of starting salaries.

An indication of how closely various features of salary schedules are correlated for the sample of 93 city school districts is provided by the data in the first seven columns and rows of Table 8. It can be seen that the scheduled minimum and maximum salaries vary relatively closely together. But the variation is not close enough to use a particular scheduled salary, e.g. starting salary, as an index for the other salaries in a schedule. For example, the starting salary for those with a BA degree accounts respectively for 69, 85 and 64 percent of the

variations among school districts in the scheduled salaries for those with a BA degree and maximum experience, an MA degree and no experience, and an MA degree and maximum experience.

It is also apparent from the data in Table 8 that there is generally a weak negative correlation between the level of salaries scheduled and the number of steps in the BA and MA tracks. That is, those with the highest scheduled salaries have a slight tendency to reach the maximum salary after teaching for relatively short periods of time.

An obvious next step in measuring the value of salary schedules is suggested by human capital theory. For those beginning teachers who wish to stay in a school district, the value of the entire salary schedule may be represented by the present value of earnings promised if the individual were to enter teaching in that district and to remain there for his or her working life. For a new teacher who is uncertain about whether to remain in teaching or not, the choice of which district to begin teaching in may be based on an expected value calculation, where starting salary and present value of salary for a district are weighted in accordance with the probability of the teacher remaining in the district.

Table 8

Correlation Among Various Features of Salary Schedules and the Present Values of the Schedules, 93 Large City School Districts 1972-73

	BA-	BA+	MA-	MA+	#BA	#MA	$PVBA_0$	$PVMA_0$	$PVBA_5$	$PVMA_5$	$PVBA_{10}$	$PVMA_{10}$
	1	-	-	-	-	-	-	-	-	-	-	-
	.83	1	-	-	-	-	-	-	-	-	-	-
	.92	.75	1	-	-	-	-	-	-	-	-	-
	.80	.86	.81	1	-	-	-	-	-	-	-	-
	-.02	.27	-.13	-.02	1	-	-	-	-	-	-	-
	-.18	.01	-.25	-.11	.84	1	-	-	-	-	-	-
A_0	.86	.99	.79	.87	.18	-.09	1	-	-	-	-	-
A_0	.82	.85	.85	.99	-.11	-.21	.87	1	-	-	-	-
A_5	.89	.98	.82	.88	.10	-.17	1	.89	1	-	-	-
A_5	.85	.85	.88	.98	-.17	-.29	.87	1	.89	1	-	-
A_{10}	.92	.96	.85	.88	.02	-.23	.98	.90	1	.91	1	-
A_{10}	.86	.82	.91	.95	-.22	-.34	.86	.98	.89	1	.91	1

BA- --Salary for a teacher with a BA degree and no experience.
BA+ --Maximum salary for a teacher with a BA degree.
MA- --Salary for a teacher with an MA degree and no experience.
MA+ --Maximum salary for a teacher with an MA degree.
#BA --Number of steps in the BA track.
#MA --Number of steps in the MA track.

(Table Cont.)

$PVBA_0$ --Constant level of yearly income that will generate the present value of the BA track at zero interest.

$PVMA_0$ --Constant level of yearly income that will generate the present value of the MA track at zero interest.

$PVBA_5$ --Constant level of yearly income that will generate the present value of the BA track at 5% interest.

$PVMA_5$ --Constant level of yearly income that will generate the present value of the MA track at 5% interest.

$PVBA_{10}$ --Constant level of yearly income that will generate the present value of the BA track at 10% interest.

$PVMA_{10}$ --Constant level of yearly income that will generate the present value of the MA track at 10% interest.

Source: Computed from data in National Education Association, Salary Schedules and Fringe Benefits for Teachers, 1972-73, op. cit.

It is convenient to measure the value of the salaries promised by a particular educational track in a salary schedule by an index that is equal to the constant level of yearly income that would generate the same present value as is generated by the salaries scheduled for those within a given track.[21] Since this index will have a value that

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[21] We compute the constant level of yearly income from data on starting salary, maximum salary and number of salary steps. It is assumed for purposes of the calculation that all salary steps within a track are of equal dollar size.

To be more specific, suppose there are m increments in salary for those in a given track, starting salary is BA-, and the working life extends from 0 to year n. The salary scheduled in year i is given by

$$(a) \quad W_i = BA- + j(\Delta W) \quad \text{where:}$$
$$j = i \text{ for } i = 0,1,\ldots,m$$
$$j = m \text{ for } n \geq i > m$$
$$W_i = 0 \text{ for } i > n.$$

The equation for the present value of lifetime earnings (LE) promised to an individual who remains in the salary track until retirement is

$$(b) \quad LE = \sum_{i=0}^{n} \left(\frac{W_i}{(1+r)^i}\right).$$

where r is the discount rate.
There is some constant level of yearly income PV which has a vlue such that

$$(c) \quad LE = \sum_{i=0}^{n} \left(\frac{PV}{(1+r)^i}\right) = PV\left(\sum_{i=0}^{n} \left(\frac{1}{(1+r)^i}\right)\right).$$

Setting (b) equal to (c) solving for PV we have

$$(d) \quad PV = \left[\sum_{0}^{n} \frac{W_i}{(1+r)^i}\right] \cdot \left[\frac{1}{\sum_{0}^{n} \left(\frac{1}{1+r}\right)^i}\right]$$

is comparable to the levels of salaries scheduled in various tracks, the use of the index will make it relatively easy to compare the regression equations estimated below which are used to test hypotheses about the causes of inter-district variation in particular scheduled salaries and in present values of lifetime earnings promised by salary schedules.

The constant value of yearly income is computed from data for the 93 city school districts using assumed rates of interest 0, 5 and 10 percent. It is assumed that working lives extend from age 25 to 65.[22]

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[22]We note explicitly that the calculated present values and equivalent constant levels of yearly income provide an index but not a prediction of lifetime earnings for those who spend their entire working lives as teachers within a particular salary track. No attempt has been made to incorporate the effects of inflation and economy wide productivity increases on the earnings profiles. Also, since we are computing all present values back to age 25, and do not take opportunity cost into account we are obviously not making any attempt to analyze the investment decision of whether it pays a teacher to earn a master's degree.

The average of the values for all 93 school districts of the constant yearly incomes that would generate present values equal to those computed from the 1972-73 salary schedules at 0, 5 and 10 percent discount rates are indicated, together with relevant figures on dispursion in the following table.

Table 9

Indices of Present Values

PV Calculated at a Discount Rate of	Average Values		Standard Deviation		Coefficient of Variation	
	BA Track	MA Track	BA Track	MA Track	BA Track	MA Track
0%	$10,915	$12,289	$1,470	$1,523	.135	.124
5%	10,338	11,576	1,319	1,397	.128	.121
10%	9,784	10,899	1,133	1,379	.116	.117

Source: Computed from data in National Education Association, Salary Schedules and Fringe Benefits for Teachers, 1972-73 op. cit.

The simple correlation coefficients computed for the indixes of present value and between these indices and the scheduled maximum and minimum salaries for those with BA and MA degrees are reported in the last six rows of Table 8. It is apparent from these data that the measures of the present values of the salaries offered to those within each of the tracks computed at different discount rates are very highly correlated with one another. The simple correlation coefficients range from .98 to 1.0. Therefore, it seems

reasonable to use throughout the rest of the analysis just one measure of present value rather than all three measures. Accordingly we will represent the lifetime incomes presumably promised by the tracks in each schedule by the constant values of yearly income which would give the same present values, when discounted at %5 rate of interest, as do the salaries scheduled in each of the BA and MA tracks, when they are discounted at that rate.[23] These measures will be labeled on PVBA and PVMA respectively.

As Table 8 shows, PVBA and PVMA (represented in the table as $PVBA_5$ and $PVMA_5$) are very highly correlated with the maximum scheduled salaries in their respective tracks. Across the school districts, the simple correlation coefficients between the present value measures and maximum schedules salaries are .98. These lifetime earnings measures are

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[23]The salaries prescribed by the schedules on basis of experience and education do not take into account annual increases in economy wide productivity, increases which presumably would lead to annual salary increases of 2-3%. Accordingly, in terms of lifetime earnings which incorporate such annual productivity generated increases, the discount rate of 5% amounts to an implicit discount rate of 7 or 8%.

less well correlated with starting salaries. The correlation between PVBA and the corresponding starting salary is .89. For PVMA it is .85. The lifetime earnings for those in the BA track are correlated positively with the number of steps. For the MA track the correlation is negative. Lastly, we note that the correlation between the lifetime earnings measures for the BA and MA tracks is .89.

Let us summarize what the data examined to this point seem to indicate. There is some variation in the relative salaries offered by particular districts to those with different levels of experience and formal training. But there are clear limits to the variation. Thus if for those with a certain level of experience and formal training a salary schedule for a particular district mandates relatively high salaries--i.e. salaries that are high in comparison with those paid to teachers with similar qualifications employed in other districts--it is unlikely that the other teachers in the district will be scheduled to receive relatively low salaries, although they may not fare quite as well in comparison with comparably qualified individuals in other districts. For the sample of city school districts, the correlation among the salaries promised to those with maximum and minimum experience are relatively large, but they are by no means perfect.

The data in Table 10 make possible a more detailed look at the interdistrict variation in the structure of salary schedules. The table reports average values, standard deviations and coefficients of variations for four measures of extra pay for experience and for two measures of extra pay for education. (These data pertain to our sample of 93 school districts discussed above.) Table 11 shows correlations among the six measures described in Table 10 and correlations of these measures to the salary measures described previously.

The data in Table 11 indicate that, for particular educational tracks, the differences between the measures of lifetime earnings and starting salaries (e.g.(PVBA)-(BA-)) are very closely related to the differences between maximum scheduled salaries and starting salaries. For the BA track the correlation for these two measures is .97: for the MA track the corresponding figure is .96. Extra pay beyond starting salary (essentially extra pay for experience) for those with a BA degree does not vary so closely with extra pay beyond starting salary for those with an MA degree. The correlation coefficient between the full differential for experience in the BA track and the equivalent differential in the MA track is .75; the correlation coefficient between the two other measures of extra pay in each track, i.e. [(PVBA) - (BA-) and ((PVMA) - (MA-))] is .78.

Table 10

Measures of Extra Pay for Experience and Education*

	Mean	Standard Deviation	Coefficient Variation
(BA+)(BA-)	$3,955	1131	.286
(MA+)-(MA-)	4,741	1128	.238
(PVBA)-(BA-)	2,818	772	.274
(PVMA)-(MA-)	3,296	808	.245
(MA+)-(BA+)	1,546	884	.572
(MA-)-(BA-)	760	296	.389

*(BA+)-(BA-) The difference between the maximum and minimum scheduled salary for a person with a bachelors degree.

(MA+)-(MA-) The difference between maximum and minimum scheduled salary for a person with a masters degree.

(PVBA)-(BA-) The difference between the index of present value and starting salary for a person with a BA degree.

(PVMA)-(MA-) The difference between the index of present value and starting salary for a person with an MA degree.

(MA+)-(BA+) The difference between the maximum scheduled salary for a person with a master's degree and the maximum salary for a person with a bachelor's degree.

(MA-)-(BA-) The difference between the scheduled starting salary for a person with a master's degree and the starting salary for a person with a bachelor's degree.

Source: Computed from data in National Education Association, Salary Schedules and Fringe Benefits for Teachers, 1972-73, op. cit.

Table 11

Correlation Coefficients--Dimensions of Salary Schedules and Measures of Extra Pay for Experience and Education

	BA-	BA+	MA-	MA+	#BA	#MA	PVBA	PVMA	(PVBA)-(BA-)	(PVMA)-(MA-)	(BA+)-(BA-)	(MA+)-(MA-)	(MA+)-(BA+)	(MA-)-(BA-)
BA-	1													
BA+	.83	1												
MA-	.92	.75	1											
MA+	.80	.86	.81	1										
#BA	-.02	.27	-.13	-.02	1									
#MA	-.18	-.01	-.25	-.11	.84	1								
PVBA	.89	.98	.82	.88	.10	-.17	1							
PVMA	.85	.83	.88	.98	-.17	-.29	.89	1						
PVBA -(BA-)	.65	.94	.59	.80	.19	-.12	.92	.78	1					
PVMA -(MA-)	.59	.73	.57	.92	-.17	-.26	.76	.89	.78	1				
(BA+) -(BA-)	.59	.94	.52	.75	.41	.09	.87	.69	.97	.71	1			
(MA+) -(MA-)	.54	.75	.51	.92	.06	.01	.73	.84	.77	.96	.75	1		
(MA+)-(BA+)	-.04	-.24	.15	.30	-.54	-.18	-.16	.29	-.25	.37	-.32	.34	1	
(MA-)-(BA-)	.09	.03	.47	.27	-.28	-.22	.07	.34	.04	-.14	-.01	.08	.46	1

Source: Computed from data in National Education Association, Salary Schedules and Fringe Benefits for Teachers, 1972-73, op. cit.

The four measures of extra pay for experience are not too strongly related to starting salaries. The simple correlation coefficients between starting salary and (BA+)-(BA-), (MA+)-(MA-), (PVBA)-(BA-) and (PVMA)-(MA-) are .59, .54, .65 and .59 respectively. The correlation coefficients comparing the four measures of extra pay for experience and starting salaries for those with an MA are of similar magnitude. The measures of extra pay are much more strongly, but not nearly perfectly correlated with maximum salaries in the various tracks. The implication is that it is the variation in maximum salaries that is most important in determining interdistrict differences in extra pay for experience.

The relation between extra pay for experience and number of steps is positive for the BA track and negative for the MA track. That is, those districts with higher relative pay for experience for those with a BA degree raise the pay at least to some extent by including additional steps. Those districts with higher pay for experience for those in the MA track provide the higher pay despite having scheduled fewer steps.

Table 11 shows also correlations between the measures of extra pay for education, i.e. (MA+)-(BA-) and (MA-)-(BA-), and their relation to the other measures of teachers' salaries. These figures do not suggest, however, any pattern of

relationship that might be of special interest in the following analysis of the impact of collective bargaining.

V

In this section we shall attempt to measure the impact of collective bargaining on teachers' salaries. As our previous discussion indicates, salary levels can be measured in a variety of ways, depending on experience and education of the teachers. Our attempt to measure collective bargaining impact will take into account the basic measures i.e. a minimum (or starting) and maximum salary for a teacher with a B.A. degree; a minimum and a maximum salary for a teacher with an M.A. degree; the previously described measures of present values for these two educational tracks. In addition we shall also try to estimate the impact of collective bargaining on the structure of teachers salaries, i.e. on the interrelation of the various salary measures, and on the number of steps, within the B.A. and the M.A. tracks, between a minimum and maximum salary.

Our basic assumption is that collective bargaining exerts its impact by marking up or raising what would have been--in the absence of unions or teachers' organizations--a set of equilibrium salaries, i.e. salaries determined essentially by market forces. But in so far as they are changed through union activities the various measures of salaries need not change either by the same percentage or by the same absolute amount. Collective bargaining may thus not only change

the absolute levels of teachers' salaries but also their structural interrelationship.

The data which we shall use pertain, as already indicated, to 93 central city school districts in the largest Standard Metropolitan Statistical Areas. To isolate and measure the impact of collective bargaining in these districts we must standardize--as much as possible--for those characteristics of the individual communities and labor markets that would create inter-area differences in salary levels and structure also in the absence of collective bargaining and teachers unions. This we shall do by using the techniques of multiple regression.

In formulating the regression which we will use we are drawing upon models of teacher salary determination developed and described elsewhere in the literature. In particular, we draw upon a salary determination model in which it is assumed that the goal of a school board is to maximize the surplus value of produced education over its cost, and in which the board achieves this goal by continuing hiring teachers until the value of marginal contribution to the total output of education is equal to the marginal cost of hiring an additional teacher.[24] Indeed our regressions

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[24]The model is described in M. O. Clement and A. L. Gustman, Factor Cost Differences, Educational Equality, and Funding Decisions in Public Education, op. cit.

may be viewed as modified version of reduced form equations implied by this particular model. One reason for these modifications is the assumed presence of collective bargaining and its impact on salary levels and structure. But an equally important reason reflects our view that even in the absence of collective bargaining a school board has to be concerned with salary issues that are ignored in a simple utility maximizing model--issues of internal salary equity, of maintaining a salary structure that contributes to the morale of the teacher work force, etc.

In one important respect, however, our formulation of the regression equation adheres closely to the assumptions which underlie the previously mentioned model of teachers' salary determinations. Specifically, as in the case of that model, our formulation does not allow for the possibility that, as a rule, school boards will be fixing salary levels with a view toward improving--over and above the formal educational requirements--the quality of the pool of applicants for teaching positions.

What is the effect of omitting considerations pertaining to teacher quality--other than formal educational training and experience--in our formulations? There are some suggestions in the relevant literature that particular characteristics of teachers--e.g. verbal ability--may have an effect on

student learning.[25] We cannot standardize our sample for such characteristics because we lack appropriate data. This however is not necessarily a shortcoming since the school boards themselves do not have at their disposal any reliable indication of what makes for teacher quality. Indeed despite the previously mentioned suggestions in the literature, it appears that no single teacher characteristic bears an important and consistent relationship to the educational effectiveness of individual teachers.[26] As a result, there is little or no evidence that school boards gear their salary policies toward maximizing educational output through variations in the quality of the teachers that they hire.[27]

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[25] H. M. Levin, "A Cost-Effectiveness Analysis of Teacher Selection," Journal of Human Resources, Winter 1970.

[26] See H. A. Averch et. al. How Effective is Schooling, Report to the President's Commission on School Finance, the Rand Corporation, 1971.

[27] See, for example, J. D. Owen, "Towards a Public Employment Wage Theory: Econometric Evidence on Teacher Quality," Industrial and Labor Relations Review, January 1972. Using data from the Coleman Report, Owen tested the hypothesis that the school boards' demand for teachers is a positive function of teacher quality, as measured teacher verbal scores. The test showed no support for the hypothesis. Levin's calculations of the marginal products (measured in terms of student verbal scores) per dollar spent on various "quality" related teacher characteristics also suggest absence of any maximizing behavior on the part of the school boards in the sample (Levin, op. cit.).

It is obvious from the salary schedules that school boards pay higher salaries for increased experience and for greater educational attainments. But for a number of reasons it does not appear likely that the salary differentials paid for experience and educational reflect primarily the school boards' desire to structure salaries in accordance with the educational effectiveness of individual teachers:

a. For many school districts, the steps within each salary schedule mandate increases that, for each of the years of experience up to a maximum, are similar in either percentage or in absolute terms. Experience beyond the maximum does not result in any further increment in pay. The obvious question raised by these schedules is: Are productivity gains really similar for teachers in each of their first twelve years and zero after that? Neither a priori nor empirical considerations suggest such a relationship.

b. It seems unlikely, given the wide variation among school districts in the pattern of payments for experience, that such differences as exist could reflect the effects of interdistrict differences in the relative productivity of teacher experience. For example, the number of steps prescribed by the schedules in our sample range from a low of four steps to a high of twenty-five steps.

c. Between 1960 and 1972, in over half of the central city school districts the number of steps was reduced. We are not aware of any systematic forces operating over this period that would act to reduce the amount of experience at which teacher productivity peaks. Rather, field interviews suggest that reducing the number of steps until maximum salary is achieved is a subtle and perhaps politically acceptable strategy by which the unions can gain salary increases for the many teachers who have yet to reach the maximum. In what is always a leading district, New York City, the number of steps in the salary schedule has been reduced from twelve in 1960 to seven in 1972, for example.

d. School boards do not normally grant full credit for experience gained in teaching outside the school district. To be sure, the value of experience may in part be specific to the background of the students taught. Nevertheless, it seems unlikely that the specific nature of some experience provides an adequate explanation for the kind of credit that is in fact granted by school boards for experience gained outside the district. The boards, where they are free to choose, behave as if the current official price for teachers with significant amounts of accumulated experience is too high given the productivity differential between experienced and inexperienced teachers.

In our view the salary differentials based on differences in teachers' experience and education derive primarily from the need for a salary structure that is based on objective standards considered as equitable by both the school boards and the teachers. Analogously to the case of an internal wage structure in a private firm, such a salary structure contributes to the maintenance of workable personnel relations by limiting managerial perogatives with respect to the sensitive area of salary diffential within the teacher work force. While an adoption of a formal salary structure may contribute to teachers' productivity by affecting favorably their attitudes toward work, it also has inevitable costs since it limits school boards ability to pay in accordance with productive contributions of individual teachers. For example, as Kershaw and McKean point out, because of a single salary schedules school boards are unable to adjust pay in accordance with relative scarcity of teachers by field and training.[28]

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[28] J. A. Kershaw and R. N. McKean, Teacher Shortages and Salary Schedules, New York, 1962.

It is relevant to the following discussion to note in this context that the adoption of formal salary structures was brought about by teachers associations, and predates institutions of collective bargaining. This is, of course, a reflection of the fact that many pressures experienced formally through collective bargaining exist also in non-union situations.

The independent variables which we will use to standardize for the effects on teachers' salaries of factors, other than collective bargaining, cannot be classified neatly as related only to the demand for teachers or to their supply.[29] To be sure, some of these variables are related primarily to the demand side and some primarily to the supply side. But other variables bear relation to both sides of the market, and still others are important because they reflect not only the forces of supply and demand but also the institutional environment which affects specific policies of teachers' organizations and of the school boards.

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[29]This means, of course, that attempts to use multiple regression results to isolate the influence of demand and supply factors on interarea differences in teachers' salaries can provide, at best, only approximate answers. But in the present context what counts is standardizing for the effects on salaries resulting from both supply and demand related factors. For our purpose there is no need to disentangle the separate effects of supply and demand related factors from each other.

The independent variables in our regression predominantly related to demand are a measure of value of taxable property; proportion of public school revenue from federal sources; and proportion of public school revenue from state sources. The independent variable predominantly related to supply is a measure of what may be viewed as opportunity cost for teachers in each area. This measure is a weighted average of the area's salaries paid to males employed in professional and managerial occupations and to females employed as registered nurses.[30]

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[30]The weights are the numbers of male and female teachers in the area. This variable is meant to measure the combined effects of real wage differences, cost of living differences, and the relative nonprecuniary aspects of employment in different communities. Intercommunity differences in real wages paid to those in occupations that are a substitute for a teaching career will, if teachers are less than perfectly mobile be reflected in their salaries.

Many teachers are part of a two-earner family. For these teachers the cost of moving to a higher paying position in another community is likely to include the cost of relocating the second earner in the family. This cost may be an important factor acting to limit the geographic mobility of teachers. The relevant statistics on the labor force status of the teachers' spouse are as follows: Two-thirds of the teachers' labor force is composed of women. Two-thirds of women teachers are married, with 83 percent of their husbands employed full time. In the case of the 78 percent of the male teachers who are married, one-third of their wives work full time. (National Education Association, The American Public School Teacher, 1965-66, Washington, D.C., 1967, pp. 39-40.)

Several of the independent variables bear a relation to both the demand and supply sides. Community income which is an important determinant of the area's socio-economic status bears a relation to the willingness and ability of those in the area to pay for education and of the productivity of expenditures per student. At the same time teachers generally prefer employment in relatively high socio-economic areas.[31] Population and enrollments are related to demand because they reflect the relative needs among the communities for teachers, the possible economies of scale in producing education, and the effects of relative class size on educational output.[32] But relative class size may bear also relation to teachers' preferences for employment in particular areas.

Some of the other independent variables pertain to the market and institutional environment in which the school boards and the teacher organizations conduct their policies.

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[31] John D. Owen, "The Distribution of Educational Resources is Large American Cities," Journal of Human Resources, Winter 1972.

[32] In the model from which the equation which we estimate has been essentially derived enrollments appear as an independent variable in the demand for education equation, and together with the number of teachers, in the production function for education. Solving the derived demand equation together with the equation for supply of teachers and substituting for the number of teachers yields the reduced form equation which we actually estimate. The number of teachers does not appear explicitly in this reduced form equation.

The findings of previous studies suggest that the process of salary determination may be affected by a relative degree of competition among the buyers of teachers' services.[33] To standardize for the differences in the market structure, we include as independent variables a measure of the number of school boards in each of the SMSA's in the sample, and a measure of the relative population in the central city areas of each SMSA. We also include a dummy variable to measure whether the school district in a given central city area is financially dependent on or independent from the local municipal government. Presumably, both the salary policies of school boards and the process of collective bargaining may be affected by the financial structure of the school district.[34] In addition we also have as one of our independent variables an index, developed by Kochan, which indicates how favorable the legal environment in a given state is to the conduct of collective bargaining by public school teachers.[35]

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[33] J. H. Landon and R. N. Baird, "Monopsony for Public School Teachers," American Economic Review, December 1971.

[34] C. R. Perry and W. A. Wildman, The Impact of Negotiations in Public Education: The Evidence from the Schools, Worthington, Ohio, 1970 pp. 142-43.

[35] Thomas A. Kochan, "Environmental Correlates of Public Sector Bargaining Laws," Industrial Relations, October 1973.

To the extent that the laws pertaining to the public sector employees reflect the general industrial relations environment of the state, they influence teacher salary determination under both union and nonunion conditions.

The final independent variables measure the percentage of teachers with an M.A. degree in the workforce of a given area and the average age of the teachers. This latter variable is used as a proxy for experience.[36] These variables are important because for a given structure of salaries they determine the structure of costs (to the school boards) and of renumeration. In addition, the education and experience structure of the teachers work force will determine the present value of the future costs and remunerations

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[36] In 1966, the average age of teachers reporting to the NEA was 38.7 years. Average experience was 11.8 years, with 8.1 years in the same school district. Median years of age and experience were 36.0 and 8.0 years respectively, with a median of 5.0 years spent in the same school district. (National Education Association, The American Public School Teachers, 1965-66, Washington, D.C. 1967, pp. 12 and 37.)

The teachers employed in the 93 central city districts in 1970 were somewhat younger than those responding to the 1966 NEA Survey. Specifically, the average teachers' age for the central city districts is 35.6 years, three years below the average for the NEA. Given the average of about 12 steps in an educational track, it would appear that an average teacher in our sample is probably two or three steps below the step for the maximum salary.

implied by a given salary structure.[37] Another reason for including these variables is that the pressures to bring about what the area's teachers would view as "equitable" salary structure are likely to be determined both by the educational and by the experience composition of the work force.

We recognize that the experience and educational composition of the area's teachers is likely to depend on a variety of factors including such pehnomena as the past history of growth in the area, the available opportunities for post B.A. education and others. Importantly, it may also depend on the specific characteristics of the salary structure. To the extent that this is so, the two variables should be viewed as endogenous to the various equations estimated below and, as a result, the coefficients on these variables will be biased.

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[37] An example of the influence of experience and education on the formation of a salary structure is provided by the suburban public school districts which, given relatively unexperienced work force, heavily dominated by new B.A.'s, would fix relatively high maximum salaries in the hope of attracting larger pools of applicants. Such policies would obviously have little effect on current costs. The example was given to us by an official teacher of a organization in the state of New York.

The impact of teachers unions or organizations is measured by two dummy variables. These variables are used to distinguish two types of union contracts. One dummy variable takes on a value of one if the agreement is a comprehensive agreement and a value of zero otherwise. A comprehensive agreement is the most formal type of an agreement and usually implies a contract which spells out in relatively great detail the conditions of employment. Comprehensive agreement are part of a wider category of contracts termed negotiation agreements. Those negotiation agreements which are not comprehensive are generally much less specific in spelling out the terms of teachers' employment. The second dummy variable which we employ takes on a value of one if the agreement is negotiatable but not comprehensive and a value of zero otherwise. With these specifications the coefficients estimated for each of the two variables will represent: (a) the effect of a comprehensive agreement as compared with a situation where there is no agreement at all; and (b) the effect of a negotiation agreement which is not comprehensive as compared with a situation where there is no agreement at all.[38]

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[38]For a description of agreements see National Education Association, Negotiation Agreements Provisions for Teachers, Washington, D.C. 1972.

It will be recognized that this formulation assures that the impact of the union is not affected by the values of the other independent variables, i.e. that the effect of union contract is to change the intercept but not the slope of the underlying wage related regression.

How will collective bargaining affect the various measures of salaries and their structure which we use as dependent variables in our regression? Relevant literature and our field interviews suggest that the most active members of teachers organizations are typically those with some years of experience and those with an M.A. degree.[39] One would therefore expect that a union would concentrate much of its attention in bargaining on making the kind of changes in the salary structure that wold be beneficial to that group. This tendency is likely to be strengthened by two other factors. First because of laws eventually requiring it and for other reasons most teachers expect eventually to get an M.A. degree.[40] Second, the typical pattern is to

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[39] Perry and Wildman op. cit. p. 155. The authors also indicate that these active members are typically male and teach at the high school level. However the concept of a single salary schedule limits the possibility of special gains for those who are male or teach in high schools.

[40] For data on educational requirements necessary to obtain a permanent teaching license see T. M. Stinnett, A Manual on Standards Affecting School Personnel in the United States, 1974 Edition, NEA, Washington, 1974 pp. 12-23. See also E. F. Kirk, A Theoretical and Empirical Study of the Impact of Collective Negotiations on Public School Teachers' Salaries in the Commonwealth of Massachusetts, Unpublished Ph.D. Dissertation, Boston College, 1974 p. 146.

earn such a degree while working, i.e. while accumulating some experience.[41] The implication thus is that raising the pay for those with an M.A. degree who have accumulated some experience would constitute a union policy popular with overall membership.

Taking into account the factors that underlie union policies and also other pressures that focus on school boards suggests a number of possible effects of collective bargaining on the various aspects of the structure of teachers salaries.

Starting salaries are the part of salary structure that are most easily perceived by the public, and negotiated increases in such salaries are usually publicly announced. Thus in so far as the public is concerned about high levels of public employee salaries the school board would be under relatively greatest pressure to keep the starting salaries down. Moreover, by their very nature starting salaries are likely to be of lesser interest to those currently employed--and that means current membership of teachers organizations--than other parts of salary structure. As a result, one would

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[41] It has been suggested that most teachers obtain their M.A. on a parttime basis because the additional earnings are not high enough to justify investing a full year of foregone earnings at the beginning of their career. See C. Friedman, "Education of New York City Public School Teachers: An Economic Analysis," Industrial and Labor Relations Review October 1964.

expect that the impact of collective bargaining on teachers' starting salaries should be weaker than elsewhere.

Changes in maximum salaries and in the number of steps in each educational track are likely to be less easily perceived by the public than those pertaining to starting salaries. And it is obvious that these changes are of greatest importance to the teachers currently employed. Increases in the maximum salary bring an immediate benefit to those who have already reached the highest steps; and, other things the same, they raise the size of the average annual increase for those with less than a maximum salary, and also raise the value of their lifetime earnings. A reduction in the number of steps in a salary track benefits those who have not yet reached the maximum in two ways. First, it increases expected future earnings. Second, it raises the value of their current increases. Except for individuals who are only one step away from the maximum, the salary increases gained as a result of reduction in the number of steps are greater the closer the particular individuals are to the maximum.[42] For example a person who is two steps away from the maximum at a time when the number of steps is reduced will receive twice the increase that he would have received if there had been no change.

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[42] As pointed out in footnote 36 an average teacher in our sample is likely to be more than one steps below the maximum salary.

Another change in salary structure that could benefit current union membership would be increasing the maximum salary by adding a step in a particular track. Since this would not raise the size of an average step, the overall benefit would not be as great as that of raising the maximum without changing the number of steps. And, similarly, in contrast to a measure that would reduce the number of steps, it would not affect the current increases of those who have not reached the maximum step. For these reasons, despite its obvious benefits the policy of increasing the maximum by adding a step is not likely to be the most attractive to overall membership.

The union is likely to have interest in raising the salaries scheduled for those with all levels of experience--education qualifications. But the preceding discussion suggests that the impact of collective bargaining is likely to be particularly reflected in the salaries of those with an M.A. degree, and with several years of experience. With respect to the measures of salary structure described previously this would mean a particularly marked impact on the spread between maximum and minimum pay for an M.A. degree. By the same token this would also imply an impact on the difference between the maximum salary for an M.A. degree and a maximum for a B.A.

The impact of collective bargaining on the pay of the M.A.'s with some experience also means that collective bargaining is likely to raise the present value of pay beyond the starting salary in the M.A. track. In so far as collective bargaining also reduces the number of steps between the starting and the maximum salary, it further increases the value of this measure of pay for experience. On the other hand, if collective bargaining increases the number of such steps its overall impact on this measure would be weakened.

In Table 12 we present results of a series of regressions in which we tried to isolate the impact of collective bargaining on the measures of teachers salaries and their structures that have been discussed previously. (The figures in parantheses are t-ratios) Following the table is a list of dependent and independent variables and their sources.

As can be seen in Table 12 most of the equations estimated for the various measure of teachers salaries and their structures have $\bar{R}^2$'s that can be considered satisfactory for cross section data. The regressions explain best the measures for salary levels, generally accounting for 55% or more of the variance. The equations for salary structure account for between 1/3 to 1/2 of the variance, and those for the number of steps, in the two educational tracks are least satisfactory. In a sense these results are not surprising since our independent variables were primarily designed to explain salary levels.

Table 12

Empirical Estimates--The Impact of Collective Bargaining on Teachers' Salaries
93 Central City School Districts, 1972
(t-ratios are in parentheses)

	BA	BA+	MA-	MA+	#BA	#MA	PVBA	PVMA	(BA+)-(BA-)	(MA+)-(MA-)	(PVBA)-(BA-)	(PVMA)-(MA-)	(MA+)-(BA+)	(MA-)-(BA-)
INT	8710.64 (6.67)	23073.2 (6.19)	7190.18 (4.96)	19879.1 (5.73)	35.267 (3.63)	24.0268 (2.81)	17475.8 (6.51)	15146.9 (5.71)	14362.8 (4.57)	12688.4 (4.54)	8767.64 (4.33)	7958.7 (4.18)	-3194.45 (-1.28)	-1520.17 (-1.89)
ENR	.002905 (1.28)	.0057857 (.89)	-.021349 (-.85)	-.003646 (-.61)	.0000233 (1.38)	.00001444 (.97)	.00341897 (.73)	-.004669 (-1.01)	.00288 (.53)	-.0015124 (-.31)	.000514 (.15)	-.0025345 (-.77)	-.00943311 (-2.18)	-.00504002 (-3.61)
POP	-.000406 (-1.10)	-.0006947 (-66.)	.0004490 (-1.09)	.00062261 (.63)	-.00000329 (-1.2)	-.000002472 (-1.02)	-.00036626 (-.48)	.0008289 (1.11)	-.000288 (-.32)	.00017366 (.22)	.0000397 (.07)	.0003798 (.7)	.00131739 (1.87)	.000855107 (3.76)
INC	.0030607 (.04)	-.0448167 (-.19)	-.0138337 (-.15)	.0130253 (.06)	.00041843 (.69)	.00032997 (.62)	.053133 (-.32)	-.036675 (-.22)	-.047866 (.24)	.0268868 (.15)	.056259 (-.44)	-.022867 (-.19)	.0578556 (.37)	-.0168938 (-.34)
ST REV	3.55017 (1.00)	-9.4840 (-.93)	6.97892 (.177)	-2.36678 (-.25)	-.0191856 (-.73)	-.0159256 (-.68)	-5.18678 (-.71)	1.5112 (.21)	-13.034 (-1.52)	-9.34595 (-1.23)	-8.73531 (-1.59)	-5.46661 (-1.05)	7.1172 (1.05)	3.42911 (1.57)
FED REV	10.1271 (.68)	16.2261 (.38)	16.6592 (1.01)	-5.13769 (-.13)	.041237 (.37)	-.055134 (-.57)	15.2686 (.5)	3.75618 (.13)	6.09882 (.17)	-21.7939 (-.69)	5.13038 (.22)	-12.9108 (-.6)	-21.3616 (-.76)	6.53178 (.72)
PROP	33.5772 (1.41)	57.3602 (.84)	41.854 (1.59)	82.6635 (1.31)	-.0916907 (-.52)	(-.04655) (-.3)	53.4054 (1.09)	75.1317 (1.56)	23.7827 (.42)	40.8052 (.8)	19.8346 (.54)	33.2808 (.96)	25.2992 (.56)	8.27616 (.57)
OP COST	.059717 (.60)	-.218877 (-.77)	.374106 (3.38)	.369643 (1.39)	-.0018659 (-2.51)	-.0010620 (-1.62)	-.05457 (-.27)	.454012 (2.24)	-278628 (-1.16)	-.0044615 (-.02)	-.114329 (-.74)	.079827 (.55)	.588545 (3.1)	.314383 (5.12)
AGE	-77.3654 (-2.79)	-300.39 (3.8)	-78.5009 (-2.55)	-316.307 (-4.3)	-.30467 (-1.48)	-.116671 (-.64)	-213.195 (-3.74)	-231.357 (-4.11)	-223.027 (-3.34)	-237.789 (-4)	-135.875 (-3.16)	-152.879 (-3.78)	-15.916 (-.3)	-1.15191 (-.07)
%MA	3.27353 (.76)	20.165 (1.65)	2.5098 (.53)	16.0103 (1.41)	.0412453 (1.29)	.0466202 (1.66)	13.5616 (1.54)	7.71468 (.89)	16.8916 (1.64)	13.5001 (1.47)	10.2896 (1.55)	5.20624 (.83)	-4.15485 (-.51)	-7.63487 (-.29)
DEP	447.673 (4.36)	552.074 (1.88)	525.395 (4.61)	232.427 (.85)	-.7461 (-.98)	-.902521 (-1.34)	587.518 (2.78)	403.506 (1.94)	104.39 (.42)	-292.866 (-1.33)	139.813 (.88)	-121.828 (-.81)	-319.643 (-1.64)	77.6167 (1.23)
NO	8.85061 (4.04)	14.0539 (2.25)	6.74984 (2.78)	12.3744 (2.13)	-.012964 (-.8)	-.0090219 (-.63)	13.4155 (2.98)	11.5625 (2.6)	5.20322 (.99)	5.62449 (1.2)	4.5647 (1.34)	4.81247 (1.51)	-1.67957 (-.4)	-2.10085 (-1.56)
CC	-5.49846 (-1.57)	-17.7942 (-1.78)	-6.91285 (-1.78)	-16.1756 (-1.74)	-.0126391 (-.48)	.0053496 (.23)	-.13.1466 (-1.82)	-13.5666 (-1.91)	-12.296 (-1.46)	-9.26297 (-1.23)	-7.64833 (-1.41)	-6.65463 (-1.3)	1.61864 (.24)	-1.41447 (-.66)

Table 12 Cont.

	BA-	BA+	MA-	MA+	#BA	#MA	PVBA	PVMA	(BA+)-(BA-)	(MA+)-(MA-)	(PVBA)-(BA-)	(PVMA)-(MA-)	(MA+)-(BA+)	(MA-)-(BA-)
LAW	30.1662 (3.74)	51.8902 (2.26)	21.6459 (2.42)	35.0855 (1.64)	-.0078428 (-.13)	-.025092 (-.48)	48.3281 (2.92)	34.7211 (2.12)	21.7239 (1.12)	13.4391 (.78)	18.1604 (1.45)	13.0742 (1.11)	-16.8056 (-1.1)	-8.52087 (-1.72)
COMP	49.0774 (.39)	163.908 (.46)	11.2744 (.08)	613.265 (1.83)	-1.46842 (-1.56)	-1.43899 (-1.74)	219.657 (.85)	533.272 (2.08)	114.841 (.38)	601.977 (2.23)	170.628 (.87)	522.042 (2.84)	449.339 (1.87)	-37.8003 (-.49)
NEG-COMP	-142.287 (-1.07)	-339.001 (-.9)	-179.774 (-1.22)	98.5211 (.28)	-2.53133 (-2.57)	-2.45332 (-2.83)	-138.898 (-.51)	199.304 (.74)	-196.7 (-.62)	278.279 (.98)	3.46336 (.02)	379.148 (1.96)	437.502 (1.73)	-37.4827 (-.46)
$\bar{R}^2$ (S.E.)	.690922 (378.533)	.560865 (1079.87)	.700231 (419.817)	.632977 (1004.25)	.15143 (2.81615)	.150759 (2.47723)	.651976 (778.061)	.698042 (767.752)	.353115 (909.922)	.483811 (810.156)	.4235 (586.401)	.534003 (551.664)	.336741 (720.246)	.383843 (232.553)

Dependent Variables*

BA- -- Salary for a teacher with a BA degree and no experience.
BA+ -- Maximum salary for a teacher with a BA degree.
MA- -- Salary for a teacher with an MA degree and no experience.
MA+ -- Maximum salary for a teacher with an MA degree.
#BA -- Number of steps in the BA track.
#MA -- Number of steps in the MA track.
PVBA -- Constant level of yearly income that will generate the present value of the BA track at 5% interest.
PVMA -- Constant level of yearly income that will generate the present value of the MA track at 5% interest.
(BA+)-(BA-) -- The difference between the maximum and minimum scheduled salary for a person with a bachelors degree.
(MA+)-(MA-) -- The difference between maximum and minimum scheduled salary for a person with a master's degree.
(PVBA)-(BA-) -- The difference between the index of present value and starting salary for a person with a BA degree.
(PVMA)-(MA-) -- The difference between the index of present value and starting salary for a person with an MA degree.
(MA+)-(BA+) -- The difference between maximum scheduled salary for a person with a master's degree and a maximum scheduled salary for a person with a bachelor's degree.
(MA-)-(BA-) -- The difference between minimum scheduled salary for a person with a master's degree and a minimum scheduled salary for a person with a bachelor's degree.

Independent Variables

INT -- Intercept term.
ENR -- Number of enrollments in public schools. (Census of Population: 1970, General Social and Economic Characteristics, Nos. 2-52, Table 83 and Table 120.)
POP -- Population of central city (or central county). (Census of Population: 1970, Number of Inhabitants, U.S. Summary, Tables 31 and 32.)
INC -- Median family income. Census of Population: 1970, General Social and Economic Characteristics, U.S. Summary, Table 188 and Table 44.
STREV -- Proportion of public school revenue from state sources.

(Office of Education, ELSEGIS III, PART B -- FINANCES: 1969-70. Data tape. Variable D on the tape as a percent of the sum of tape variables ($C + B_{14} + D + E_{15}$).

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*Source: National Education Association, Salary Schedules and Fringe Benefits for Teachers, 1972-73; op. cit.

FED REV -- Proportion of public school revenue from federal sources. (U.S. Office of Education, ELSEGIS III, PART B -- FINANCES, 1969-70, Data tape. Variable E_{15} on the tape calculated as a percent of the sum of tape variables ($C + B_{14} + D + E_{15}$).

PROP -- Market value of taxable real property per capita. (Calculated as the ratio of assessed value of all real property subject to local general property taxation divided by the aggregate assessment-sales price ratio of measurable sales of all types of real property, divided by 1970 population. Where in certain cases, central city data were not available, county data were used. Census of Governments: 1972, Volume 2, Taxable Property Values and Assessment Sales-Price Ratios, pt. 1, Table 4 and pt. 2, Table II.)

OP COST -- Opportunity cost for public school teachers--a weighted average of the wage for female registered nurses and male professional technical and kindred workers. (Weights used are the percentages of female teachers, Census of Population: 1970, Detailed Characteristics, Nos. 2-52, Table 173 and Table 176 and General Social and Economic Characteristics, Nos. 2-52, Tables 89 and 122.

AGE -- Median teachers' age--a proxy variable for years of experience. (Census of Population: 1970, Detailed Characteristics, Nos. 2-52, Tables 173 and 174.)

MA -- Proportion of Teachers with an M.A. or higher degree. (Office of Education, Statistics of Local Public School Systems, Fall 1969: Pupils and Staff, Table 4.

DEP -- Dummy variable with value of 1 if school district is fiscally dependent, 0 otherwise. (Census of Governments: 1967, Vol. 4 No. 1, Table 8 and Vol. 5.)

NO -- Number of school districts operating in the SMSA. (This number is the sum of the number of operative districts in each component county (or part of county) of the SMSA. Census of Population: 1970, Number of Inhabitants, Nos. 2-52, Table 13 and U.S. Summary, Table 32; Office of Civil Rights, Directory of Public Elementary and Secondary Schools, Fall 1968; Directory of Public Elementary and Secondary Schools, Fall 1970; Office of Education, Education Directory: Public School Systems, 1969-70.)

CC -- Proportion of SMSA population that lives in a central city. (Census of Population: 1970, Number of Inhabitants, U.S. Summary, Tables 32 and 34.

LAW -- An index that is designed to measure state legal requirements for recognition of and bargaining with teachers' organizations. (From Thomas A. Kochan, "Environmental Correlates of Public Sector Bargaining Laws," Industrial Relations, October 1973, pp. 322-34.

COMP -- Dummy variable, value of 1 indicates the existence of a comprehensive agreement, 0 otherwise.

NEG-COMP-- Dummy variable, value of 1 indicates the existence of a negotiation agreement which is not a comprehensive agreement. (N.E.A., Negotiation Agreements Provisions for Teachers, 1972 Edition; Part I, Scope of Agreement and Association, Board of Trustee Rights Provisions, pp. 1-63.)

The t-statistics for the first seven variables in the regressions--those labeled as reflecting primarily the forces of supply and demand--indicate in a number of cases that the coefficients are significantly different from zero. This is particularly true for the measure of opportunity cost which is significant in several equations pertaining to the pay of those with an M.A. degree. But in general the coefficients on the demand and supply variables estimated in the various equations are not significant. F-tests indicate that this group of variables adds significantly to the explanatory power of the regressions in only three of the fourteen regressions--the equation for the number of steps in the B.A. track, the equation for (MA+)-(BA+) and the equation for (MA-)-(BA-).[43] As pointed out later, the demand and supply variables played a much more important role in 1960, i.e. before the advent of formal collective bargaining.

The data in Table 12 indicate that the age variable is significantly and negatively related to all measures of

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[43]The F-statistics, in order of the regressions in Table 12, with 7 and 77 degrees of freedom, are: .4408; .3073; 1.8143; .6348; 3.5821; 2.1089; .2287; .8421; .8994; .6030; .6871; .5136; 4.9986; 9.4665.

levels of teachers' salaries and also to salary differentials associated with accumulated experience (e.g. (BA+)-(BA-)). In other words, where teachers are younger, both scheduled salaries and rewards for experience are relatively high. One reason is likely to be that relatively young age of teachers reflects recent growth of employment in the district or conditions that encourage high turnovers, i.e. factors that put upward pressure on salaries. This is also the result that is suggested by cost considerations. Obviously, it is relatively inexpensive to establish high salaries for experience in a situation where only a few teachers have accumulated many years of teaching.

The variable indicating the percent of teachers with an M.A. degree does not bear a significant relationship to either salary levels or to the measures of salary structure.

The three variables which reflect the financial structure and the competitive conditions of the labor markets in individual areas are significantly related to the levels of salaries but not to the differentials for experience or education or to the number of steps in the two tracks. One finding is that salaries paid by districts that are financially dependent on local governments are higher than salaries paid by independent districts. This appears to be consistent with the general implication of the argument advanced by Wellington and Winter, i.e. that public employees are likely

to be more successful in raising salaries the more difficult it is for the public to discern the cost of the salary increase.[44] In a dependent district increases in teachers salaries may be only one of many causes leading to tax increase. Another finding is that where there is more competition on the demand side--i.e. where there is a large number of districts in the SMSA and where the central city district is small relative to the size of the surrounding SMSA--salaries are higher.

In the case of the law variable, the results are similar to the above. Where the legal environment is favorable to collective bargaining by teachers, all scheduled salaries are higher. However, the differential pay for additional experience of for education is not significantly affected by the legal environment.

The fact that the four variables measuring financial, legal and competitive structure affect the levels but not the structure of salaries appears to be quite reasonable. There is nothing in these variables to suggest that they should have a differential effect on the various elements of the salary structure.

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[44]Wellington and Winter, op. cit. p. 31, 198-99.

We turn now to the findings pertaining to the impact of collective bargaining. These findings are generally consistent with the expectations that were based on some of the relevant literature and on our field interviews. Specifically, collective bargaining appears to affect most strongly the salary measures which pertain to those with an M.A. degree and some experience. With an exception of the regressions for the number of steps--when it appears that the unions reduce the number of steps in the two educational tracks--comprehensive agreements have a much more pronounced impact than negotiation agreements which are not comprehensive.

To facilitate our discussion we report in Table 13 the ratios of the estimated coefficients on the two measures of collective bargaining to the mean values of the corresponding dependent variables. Our discussion led us to believe that collective bargaining is likely to increase the pay for experience for those with an M.A. degree. The data indicates that the pay for experience, as reflected in the spread between the maximum and the minimum pay for a teacher with an M.A. degree, is increased under a comprehensive agreement by about 12.7% of the average spread for the sample. Since, as the data show, collective bargaining also leads to some reduction in the number of steps in the M.A. track, it has an even greater effect on the present value of the extra pay for experience. As can be seen, (PVMA)-(MA-) is increased by 15.8%.

Table 13

The Impact of Collective Bargaining--In Percentage Terms--On Components and Features of Teachers' Salary Structure

	Type of Contract	
Dependent Variable	Comprehensive	Negotiation, Not Comprehensive
BA-	.7%	-1.9%
BA+	1.4	-2.9
MA-	.1	-2.2
MA+	4.7*	.8
#BA	-12.9	-22.3**
#MA	-11.4*	-19.5***
PVBA	2.1	-1.3
PVMA	4.6**	1.7
(BA+)-(BA-)	2.9	-5.0
(MA+)-(MA-)	12.7**	5.8
(PVBA)-(BA-)	6.1	.1
(PVMA)-(MA-)	15.8***	11.5*
(MA+)-(BA+)	29.1*	28.3*
(MA-)-(BA-)	-5.0	-4.9

*Coefficient significant at 10 percent level.
**Coefficient significant at 5 percent level.
***Coefficient significant at 1 percent level.

Comprehensive agreements appear also to have an impact on the difference between a maximum M.A. salary and a maximum B.A. salary. In dollar terms the average impact amounts to about $450.00 which is $150.00 less than the impact of collective bargaining on (MA+)-(MA-). But since the average difference between a maximum pay for an M.A. and a maximum pay for a B.A. is relatively small, Table 13 indicates a relatively large percentage impact of close to 30 percent.

What about the direct impact of comprehensive agreements on the maximum salary of a teacher with an M.A. degree? Starting salary constitutes almost two thirds of the total amount of the maximum M.A. salary. This means that, in so far as collective bargaining influences only pay for experience, its overall impact on the total maximum salary is going to be smaller than on (MA+)-(MA-). The impact shown in Table 12 is 4.7%. The finding for the present value of the salary scheduled for a person with an M.A. (i.e. PVMA) indicates an impact of collective bargaining of about the same size.[45]

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[45] It will be seen in Table 13 that the union impact on PVMA is actually slightly less than on MA+. This is so despite the fact that the union presumably also reduced the number of steps in the M.A. track. The reason is that collective bargaining has relatively small effect on the M.A. salary paid during the first few years of tenure when starting salary represents the greatest proportion of the total salary. While these early years enter into the calculation of PVMA they do not affect the maximum salary of an M.A.

The data in the two tables indicate no significant impact of collective bargaining on starting salaries. In view of our previous discussion this is perhaps not surprising.

All told then, our findings indicate that collective bargaining does exert some impact on salaries of public school teachers. This impact is focused, however, on a limited number of characteristics of the salary structure--the number of steps in the B.A. and the M.A. tracks, and the renumeration of experienced teachers with an MA degree.

We should recognize that our findings may not reflect the full impact of collective bargaining on teachers' salaries. The reason is that there may be a spillover of union settlements' influence to unorganized areas. The findings indicate only the differential effect of the existence of a contract in particular areas; they do not show to what extent, if any, collective bargaining has affected salaries in those areas which do not have collective bargaining contracts but which have been affected by the spillover.

VI

We can get further insight into the process of salary determination of public school teachers by considering a period prior to the establishment of formal collective bargaining. Specifically we can use 1960 data for a sample of 84 out of the 93 central city school districts which were examined in our previous regressions.[46] The data are fully comparable to those used for the year 1972.

The results of 1960 regressions for the same dependent variables as those examined before are presented in Table 14. From the set of independent variables we excluded, however, the two measures of union contract and the measure of the legal environment. As the table indicates, the demand and supply related variables enter much more significantly into the process of salary determination than in 1972. F-tests indicate that these variables are, in fact, highly significant as a group.[47]

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[46]The list of the 84 central city school districts is in Appendix A.

[47]The values of the F-statistics for the twelve equations (in the order of Table 14) are: 4.5039; 4.9951; 4.6023; 5.1777; 6.4305; 4.8110; 4.7145; 4.8819; 5.6845; 6.2333; 5.1767; 5.7428; 7.7680; 5.0081. With 7 and 71 degrees of freedom, all of these are significant at the 1% level.

Table 14
Determinants of Teacher's Salaries, 1960
84 Central City School Districts
(t-ratios are in parentheses)

	BA-	BA+	MA-	MA+	PHA	PVTA	PVMA	(BA+)-(BA-)	(MA+)-(MA-)	(PVBA)-(BA-)	(PVMA)-(MA-)	(MA+)-(BA+)	(MA-)-(BA-)
INT	1803.1 (2.69)	3015.23 (3.4)	1994.58 (2.8)	1943.13 (2.37)	22.9873 (2.83)	15.7031 (1.91)	2816.4 (2.5)	1963.13 (1.82)	1752.15 (1.49)	-51.5495 (-.05)	954.092 (1.25)	-30.543 (-.04)	-1672.09 (-2.06)	-31.575 (.38)
DAR	-.00327644 (-.15)	-.03724626 (-1.65)	-.00003923 (-.00)	-.00791651 (-2.15)	.0000330644 (1.52)	.0000270137 (1.27)	-.0058767 (-2.04)	-.0062748 (-2.25)	-.03637436 (-2.29)	-.00719793 (-2.65)	-.05573472 (-2.88)	-.00623583 (-3.34)	-.0036904446 (-.33)	.0000334282 (.26)
POP	-.00000233254 (-.01)	.00010629 (3.59)	-.00004467264 (-.67)	.00011851 (2.22)	-.0000058124 (-1.65)	-.0000058166 (-1.64)	.0005764995 (2.24)	.0006990327 (2.28)	.00115859 (2.54)	.00126526 (2.99)	.0015777267 (3.71)	.00133699 (3.71)	.00000622522 (.24)	-.0000644937 (-.37)
INC	.25468 (2.23)	.222744 (1.78)	.201726 (2.87)	.239512 (1.67)	-.0001948312 (-2.17)	-.0002058656 (-2.47)	.256751 (2.32)	.332554 (2.87)	.066107 (.55)	.078114 (.24)	.178814 (1.4)	.105824 (1.45)	.0158559 (.22)	.0501233 (1.43)
ST DEV	-2.3983 (-1.54)	-12.5816 (-2.44)	1.69152 (.82)	-6.8408 (-1.65)	-.0099788 (-1.65)	-.024:622 (-2.22)	-5.36273 (-2.54)	-3.03373 (-.97)	-10.3657 (-3.02)	-8.53555 (-2.8)	-6.16295 (-2.78)	-4.732 (-2.26)	5.72372 (2.46)	3.95355 (3.91)
POD DEV	-3.61228 (-1.16)	-25.3777 (-4.79)	-1.60598 (-.22)	-25.8824 (-1.67)	-.155484 (-1.69)	-.163825 (-1.82)	-15.4242 (-1.26)	-22.4559 (-.99)	-25.7174 (-1.99)	-24.1843 (-2.94)	-11.8253 (-1.42)	-9.96237 (-1.26)	3.49723 (.4)	1.9642 (.52)
PROP	25.1415 (.77)	-11.8762 (-.33)	34.6938 (1.08)	-12.915 (-.46)	.435502 (3.2)	.422758 (2.7)	-22.0168 (-1.03)	-19.2198 (-.94)	-21.5313 (-.96)	-27.2267 (-1.26)	-33.9122 (-2.47)	-1.4795 (-.09)	4.27878 (.55)	
CR DUP	.461393 (3.44)	.83756 (3.25)	.520959 (4.07)	1.19328 (4.67)	-.00750541 (-1.72)	-.00126826 (-.25)	.805624 (3.46)	1.01531 (5.22)	.369714 (1.72)	.670285 (3.25)	.344103 (2.5)	.423195 (3.74)	.360529 (2.54)	.0647452 (1.04)
AGE	-17.1509 (-1.43)	-30.1655 (-2.22)	-20.1139 (-2.05)	-26.6703 (-.96)	.227313 (2.62)	.291164 (2.99)	-37.0525 (-2.93)	-39.6512 (-2.05)	-32.2502 (-.58)	5.46615 (.27)	-19.7243 (-2.42)	-9.55128 (-.72)	5.64762 (.38)	-12.2049 (-1.39)
MHA	1.86628 (.74)	8.41904 (1.51)	1.62671 (.75)	7.35492 (2.62)	.0242834 (.29)	.0087914 (.37)	5.95226 (2.66)	5.80423 (1.83)	4.94308 (2.48)	5.7633 (2.79)	4.48732 (2.07)	3.59773 (2.94)	.9068772 (.4)	.2955567 (.24)
DEN DEN	29.9691 (.24)	92.9989 (.7)	77.3504 (1.23)	77.0411 (.62)	-1.59635 (-2.22)	-1.87384 (-2.5)	126.519 (2.18)	141.438 (2.49)	72.0328 (.69)	-.362407 (0)	55.5471 (1.42)	66.0678 (1.81)	-25.9523 (-.23)	56.6266 (1.17)
ND	1.45197 (1.92)	-1.37537 (-.84)	1.52064 (1.94)	-1.66583 (-1.07)	.00561359 (1.61)	.00389186 (1.43)	-.674755 (-.55)	-.726245 (-.62)	-2.82016 (-2.19)	-3.12295 (-2.53)	-3.12632 (-2.56)	-2.20665 (-2.85)	-.291485 (-.33)	.0148952 (.26)
CC	.851647 (.25)	-9.45066 (-2.29)	-1.12335 (-.57)	-7.31.7866 (-1.04)	.0259978 (1.22)	.0303191 (2.22)	-6.5727 (-2.25)	-6.56709 (-2.05)	-8.83562 (-3.04)	-6.03624 (-1.94)	-7.37574 (-3.52)	-5.82483 (-2.66)	2.7279 (1.05)	-1.62516 (-1.42)
χ^2 (d.f.)	.700293 (20.0.01)	.670878 (419.939)	.78072 (21.658)	.705848 1424.015)	.295643 (21.484455)	.28054 (21.51457)	.716953 (344.326)	.783426 (328.868)	.434206 (360.827)	.665093 (365.655)	.54035 (233.055)	.579629 (220.924)	.23776 (244.938)	.397285 (274.2...)

Dependent Variables*

BA- -- Salary for a teacher with a BA degree and no experience.
BA+ -- Maximum salary for a teacher with a BA degree.
MA- -- Salary for a teacher with an MA degree and no experience.
MA+ -- Maximum salary for a teacher with an MA degree.
#BA -- Number of steps in the BA track.
#MA -- Number of steps in the MA track.
PVBA -- Constant level of yearly income that will generate the present value of the BA track at 5% interest.
PVMA -- Constant level of yearly income that will generate the present value of the MA track at 5% interest.
(BA+)-(BA-) -- The difference between the maximum and minimum scheduled salary for a person with a bachelors degree.
(MA+)-(MA-) -- The difference between the maximum and minimum scheduled salary for a person with a masters degree.
(PVBA)-(BA-) -- The difference between the index of present value and starting salary for a person with a BA degree.
(PVMA)-(MA-) -- The difference between the index of present value and starting salary for a person with an MA degree.
(MA+)-(BA+) -- The difference between maximum scheduled salary for a person with a master's degree and a maximum scheduled salary for a person with a bachelor's degree.
(MA-)-(BA-) -- The difference between minimum scheduled salary for a person with a master's degree and a minimum scheduled salary for a person with a bachelor's degree.

Independent Variables

INT -- Intercept term.
ENR -- Number of enrollments in public schools. (Census of Population: 1960, General Social and Economic Characteristics, Table 73 and Table 83.
POP -- Population of central city (or central county). (Census of Population: 1960, Number of Inhabitants, U. S. Summary. Table 30 and Table 31.
INC -- Median family income. (Census of Population: 1960, General Social and Economic Characteristics, Vol. 1, Part 1 Table 154 and Table 36.)

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*Source: National Education Association, Salary Schedules, Classroom Teachers, Urban Districts 100,000 and Over in Population 1959-60 and Salary Schedules, Classroom Teachers, Urban Districts 30,000-98,000 in Population, 1959-1960, both Table 6, Col. 5.

ST REV -- Proportion of public school revenue from state sources. (National Education Association, Selected Statistics of Local School Systems 1960-61, Table 6, col. 7.)

FED REV -- Proportion of public school revenue from federal sources. (National Education Association, Selected Statistics of Local School Systems 1960-61, Table 6, col. 8.)

PROP -- Market value of taxable real property per capita. (Calculated as the ratio of assessed value of all real property subject to local general taxation divided by the aggregate assessment-sales price ratio of measurable sales of all types of real property, divided by 1960 population. Data was gathered by county. Census of Governments: 1962, Volume 2, Taxable Property Values, Tables 21 and 22.)

OP COST -- Average of wage for female registered nurses and male professionals, weighted by percentage of male and female teachers employed full-time in the district. (Census of Population: 1960, General Social and Economic Characteristics, Tables 76, 86, 124).

AGE -- Median teacher's age--a proxy variable for years of experience. (Census of Population: 1960, Detailed Characteristics, Tables 122 and 123).

MA -- Proportion of teachers with an MA or higher degree. (National Education Association, Selected Statistics of Local School Systems 1960-61, Table 6, cols. 15, 16, 17).

DEP -- Dummy variable with value of 1 if school district is fiscally dependent, 0 otherwise. (Census of Governments: 1962, Vol. 4, No. 1, Table 8).

NO -- Number of school districts operating in the SMSA (Census of Governments: 1962, Vol. 5, Table 4).

CC -- Proportion of SMSA population that live in a central city. (Census of Population: 1960, Number of Inhabitants, Table 33).

The differing importance of the demand and supply variables in the 1960 and the 1972 regressions does not appear to be a result of purely mechanical factors. When the 1972 regressions are rerun for the 84 central city districts--to make the sample exactly the same as in the 1960 regressions--the results are essentially unchanged from those reported in Table 12. Moreover, the supply and demand related variables remained more significant in the 1960 regressions than in the 1972 regressions even when the two contract and the law variables were added to the independent variables in the 1960 regression or subtracted from the independent variables in the 1972 regression.[48]

One possible reason for the 1960-72 difference in the importance of the local supply and demand factors in the process of salary determination of public school teachers is the rise of collective bargaining. Specifically the presence of collective bargaining may create an awareness of the terms of the contracts signed in other areas and a tendency toward

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[48]When we added the contract and the law variables to the 1960 regression, these variables were generally not significant. A notable exception was the regression for the starting salary of a teacher with a BA degree. The implication is that there was some tendency for collective bargaining to develop in the areas where in the preunion period starting salaries were relatively high.

imitation. If that happens, the relation between the local market forces and the salaries of public school teachers is likely to be weakened. This tendency may be strengthened by the increasingly active role played by national organizations of teachers.

Assuming that collective bargaining does, in fact, account for weakening the influence of market forces, has such weakening taken place only in those areas where formal bargaining takes place or has the salary setting environment been affected in all areas? To test whether supply and demand variables played a different role in 1972 in union areas from those in non-union areas we added a set of interaction variables to the regressions reported in Table 12. These were intereaction variables between the set of market variables (i.e. the first seven variables reported in Table 12) and the two measures of collective bargaining contracts. The F-tests indicated that, in general, these interactions were not significant.[49] These findings imply that in so far as the

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[49]The f statistics were in the order of the regressions, as follows: .3454; .3095; .6892; .2438; .2950; .5678; .3158; .3156; .9980; .4050; 1.858; 1.9112; .9493; .8217.

rise of collective bargaining weakened the influence of the local supply and demand factors on the process of teachers' salary determination, it had this effect both in cities with formal contracts and in those without such contracts.

The rise of collective bargaining, however, is not the only possible explanation for the weakening of the impact of local market forces. It is possible, for example, that in the twelve year period teachers have become more mobile and that the boundaries of their labor markets have widened accordingly. The result of such a change would be lesser influence of the local supply demand factors. Another possible explanation may lie in the developing excess supply of teachers--a situation which could weaken the constraints imposed by local market forces and increase the discretion of the local boards in the process of salary determination. At the same time it is not obvious why teachers' mobility should have increased between 1960 and 1972; and one should perhaps question whether by 1972 excess supply has existed for a long enough period to have had a major influence on the process of salary determination of public school teachers.

In the light of the preceding it is clear that we cannot make a definite statement about the factors that brought about the weakening of the influence of the local market

forces in the process of teachers' salary determination. Our findings do suggest however the possibility that, in addition to the previously discussed effects on teachers salaries and their structure, collective bargaining weakens the direct role of local market forces on inter-area variations in these salaries.

Part Two

Teachers' Pensions: An Analysis of Interstate Variations

I

The question of what determines levels of pension benefits to be received by different groups of employees remains a relatively unexplored subject in labor economics. This is particularly true with respect to public employment--a sector where pensions have been a well established employee benefit for decades. The purpose of this part of the study is to remedy, at least partly, this deficiency. Specifically, we attempt to identify the reason for interstate differences in pensions received by public school teachers and to isolate the influence exerted on the levels of these pensions--and also on the contributions made by the employees--by teachers' organizations.

Pensions are an integral part of teachers' compensation in every one of the fifty states. Except for a few major cities, teachers' pension programs are administered and regulated by the states themselves. Within each state teachers covered by the programs contribute to the state pension fund in accordance with a uniform state-wide schedule. Similarly, the pensions received by the retirees are determined in accordance with formulas that are applied uniformly within each state. The state-wide uniformity of the contribution schedules and of the formulas that determine pensions is in contrast to the fact that salaries of teachers vary in each state among

individual school districts, depending on the differences in the supply and demand and other factors characterizing local labor markets. In effect this means that in determining pension formulas and contribution schedules the state may be said to take the salary levels as given; and analogously, from the viewpoint of local school boards the relationship between salary and pension is determined by an outside agency.[50] This institutional environment--i.e. the division of responsibilities between the state and the school districts--differs considerably from that in which pensions and contributions are determined for private, federal or state employees.

As already indicated, a crucial issue that we concern ourselves with is the impact of teacher organizations on the various state pension systems. Given the state-wide nature of these systems, the teacher organizations--primarily state or local bodies of the NEA or the AFT--attempt to exert their influence through lobbying in state legislatures. In so far as this lobbying is successful the changes it

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[50]There are a few exceptions to the above. Sources at the National Education Association indicated to us that very recently in a few cases local school boards have been permitted to provide supplementary pension benefits.

brings about benefit all the teachers in a state--whether they are represented on a local basis by the organization or not. While this fact may weaken somewhat the impact of the NEA or the AFT, it is still possible that these organizations affect, in a measurable way, the systems of particular states.

Our analysis of the interstate pattern of teachers' pensions also provides information relevant to the question of the impact of Social Security on other pension programs. Since state retirement systems for teachers may join Social Security at their own option, and since many have not exercised this option, an analysis of interstate differences of pension plans given as an opportunity to examine with cross-section (rather than time series) data the relationship between pension benefits, employee contributions and Social Security. Such an examination may, in turn, throw some light on the question of the impact of Social Security on the aggregate level of savings. The reason is that while Social Security benefits are financed essentially on a pay-as-you-go basis, many of the state pension systems are, at least partially, funded. Thus in so far as Social Security partially replaces state pension systems, and other saving behavior is not affected by this replacement, it may have an effect of reducing aggregate savings.

In addition to the differences in the coverage of Social Security the state pension plans differ also in other respects. First, the division of the public share of pension costs between the state and local districts varies from one state to another. Second, individual states differ in their actuarial procedures and therefore in the way in which they fund their liability for current and future pensions. And third, some states have established separate retirement programs for teachers while in other states teachers and other public employees are part of the same retirement system whether they are members of the organization or not.

The influence of all these factors may be considered most fruitfully in the context of a formal analytical framework. However before proceeding with a more formal analysis we must consider briefly the way in which we measure pensions.

II

The measure of pensions which we use is derived from formulas determined by the legislatures of the various states. These formulas relate individual pensions to salaries and length of service of individual teachers. We apply these formulas to average salaries of teachers covered by each state's pension plan and thus derive an interstate index of pension benefits. Since teachers'

pension benefits contain returns not only to employer but also to employee contributions, an analysis of pension systems must take account of interstate differences in these employee contributions. Accordingly we compute an index of individual contributions to the pension funds using the available state schedules and applying them, in a way analogous to the computation of pensions, to the data on average salaries.

We believe that, at least in the case of teachers' pensions, this approach is more useful than the alternative method used in some studies of supplementary payments, i.e. a method whereby the value of pension benefits is measured by current employer contributions to the pension system.[51] First, since in many states liabilities incurred for pension benefits earned by those employed in the current period are not fully funded the relationship between current contributions and pension benefits will depend on the particular funding scheme employed by the state. Second, some of the liabilities which in the

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[51] For an example of such a study see Robert G. Rice, "Skill, Earnings, and the Growth of Wage Supplements," American Economic Review, Vol. 56, No. 2 pp. 583-593.

past were only partially funded may come due in the current period, and, therfore, part of the current employer contributions may be used to pay them off. Third, part of the current contributions may be used to pay off liabilities which were actually never funded at all.[52] Fourth, since actuarial practices differ considerably among individual states even the same degree of funding may call for different contributions. For all these reasons current contributions do not provide an index of actual current costs of pension systems and thus cannot be used to provide an index of interstate differences in pension benefits.[53]

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[52]These unfunded liabilities may have arisen for two reasons. In most states it has been a practice to provide pension benefits for teachers who were employed within a state prior to the establishment of the state retirement system. And, in many states promised pension benefits for years of service already rendered have been frequently revised upward without required funding at the time when these additional liabilities have been incurred.

[53]Another approach to measuring pensions would base the estimates of the benefits on the pensions received by recent retirees. In the case of teachers, however, pension data for this group are available for only a limited number of states. Moreover, the complementary data, such as length of service for these retirees, which would make possible an analysis of the reason for interstate differences in pensions are not readily available.

Although the pension formulas that we use in our approach vary considerably among the states, they may be represented in a general form as:

$$P = \alpha + \beta\ (FAS)\ (Yrs) + \gamma\ (Yrs)$$

where

P = Pension

FAS = Final average salary

Yrs = Years of service

and α, β and γ are parameters.

The "final average salary" is calculated differently among the states. In some states it is calculated as an average of the salaries received in the last few years (e.g. three) of service; in other states it is calculated as an average of the highest salaries received within a given period before retirement (e.g. the best 3 years within the last 5 years). Where the formulas called for FAS to be computed as a 3 year average we approximated FAS by using, for each state, the average salary in the school year 1972-73 for all teachers covered by the state retirement system.[54] Where the formula called for FAS

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[54] In a number of states some of the major cities have separate pension systems. In such states the average salaries used to approximate FAS pertained only to those teachers covered by the state systems. We could presumably collect data on the actual final salaries of the teachers retiring in a recent year and use these in our analysis. However, since the retiring teachers would be the oldest in the system and thus not representative in terms of training and salary history, it is doubtful that their salaries would represent the level of salaries for which the current state pension formulas were designed.

based on a period other than 3 years, our index was adjusted appropriately on the assumption that salaries increase at an annual rate of 3 percent.

"Years of service" pertains to years of employment as a teacher within a given state. In a number of states, however, special provisions are available for transferring credit for out-of-state service.

The parameters α and γ--expressed in dollars--are most commonly zero. But in some states they may take on other values.[55] The parameter β commonly varies from .01 to .03. This parameter varies, of course, among the states. But it also may vary within a state, depending on years of service and the FAS.

The state pension formulas together with additional conditions are designed in such a way that the pension benefits will fall below the final average salary. Since in the actual formulas the influence of α and γ is relatively minor, where the value of β in the equation is low pension benefits will fall below FAS. This will be true even for those with many years of experience. In the state formulas where β value are relatively high additional conditions are imposed which effectively limit the size of the pensions. For example these conditions may include provisions specifying pen-

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[55]For example the formula in Michigan is 1.25% of the first $8400 of the FAS plus 1.5% of the remainder of the FAS, all multiplied by years of service. For salaries above $8400 this reduces to P = .015 (FAS) (Yrs) - 21 (Yrs). For Louisiana the formula is $300 + .02 (FAS) (Yrs).

sion limits expressed as a percentage of FAS or they may set a maximum number of years for computing pension benefits.

The formula approach can be used fruitfully in 39 of the 48 contiguous states.[56] In the nine states which were not included in the study the value of the pension received is determined, at least in part, by the value of an annuity that is purchased with the contributions made by the employers, the employees or both. Thus to compute pensions in these states we would need a typical age earnings profile for a state--an undertaking that would require information on the salary steps in each one of the school districts within individual states, the changes over time in these salary schedules, the employment mix of the school districts and the changes in this mix over time. Moreover, we would need relevant information on the investment experiences of the nine state funds. A great deal of the required information is simply not available.

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[56]Given the geographic isolation of the labor markets in Hawaii and Alaska and the obvious special characteristics of these states we decided to exclude them from the study. The nine contiguous states for which our approach could not be used are: Idaho, Indiana, Iowa, Maryland, Mississippi, Nebraska, New York, Oregon and Wyoming.

We should note that pension benefits computed on the basis of the formulas do not reflect interstate differences in such characteristics of a retirement system as vesting, disability and survivor benefits, and early retirement. While this is something of a limitation, it still leaves the formula approach as by far the most practical method of measuring pension benefits.

III

There may be several reasons why the state becomes involved in the arrangements pertaining to retirement of teachers.[57] For example there are likely to be economies of scale with respect to the management of investments, the spreading risk of adverse mortality experience, the costs of administration and other aspects of the retirement system.[58] Also since education is generally viewed as a state function which has been delegated to localities,

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[57]The following discussion focuses on state policies pertaining to pension systems of teachers. However, a great deal of it is also relevant to the pension system of other local government employees. As already indicated, with the exception of a few large cities, teachers are covered by state-wide pension systems. This is not so in the case of the other local government employees who are frequently covered by purely local systems. (See, for example, the data on the pension systems of fire fighters in International Association of Fire Fighters, Pension Profile, Washington, D.C. 1973.)

[58]Thomas P. Bleakney, Retirement Systems for Public Employees, Homewood, Illinois, 1972, p. 20.

the state may wish to assure the soundness of teachers retirement programs. None of these factors provides, however, a reason why a state would prescribe--through state imposed formulas--a relationship that would rigidly link teachers' salaries, length of service and retirement benefits. The existence of the state-wide formulas that prescribe the size of pensions seems to imply that the state's concern goes beyond that about efficiency or soundness of a retirement system, and that it relates directly to the conditions under which retired teachers will live. In fact, it appears reasonable to assume that the state considers it one of its functions to make sure that teachers retire under conditions that meet some sort of a standard that is acceptable in terms of both material welfare and of equity.[59] If that is so, the retirement conditions of the teacher influence what may be termed the utility of the state.

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[59] While some states introduced state-wide pension systems for teachers prior to the enactment of Social Security, their pension policies were undoubtedly also influenced by the provisions of the original Social Security law. These provisions excluded from Social Security coverage state and local government employees. In so far as the states have been motivated by the same factors that led to the enactment of Social Security, they may be viewed as taking a paternalistic position with respect to retirement conditions of teachers--i.e., a position resulting from the differences in the time horizon between individuals and the state as a whole.

If the state were concerned only about the retirement status of teachers it could, of course, in an extreme case, simply require all teachers in the state to purchase pensions until its utility gain from a marginal purchase would be equal to zero. But we know, in fact, that the states do not require that the teachers should bear the full cost of pensions. Accordingly, it is reasonable to infer that in instituting a pension system the state is constrained by considerations pertaining to the utility of the currently employed teachers. In other words, the implication is that individual utility functions of teachers appear as an argument in the utility function of the state.

These considerations lead us to the formulation of a model in which the utility of the state is determined in accordance with the following utility function:

$$(1)\quad U_s = U_s(P,\ SS,\ W,\ U_i[(W-C_i),\ P,\ SS]\ ,X_o)$$

Equation (1) assumes that state's utility (U_s) is determined by the retirement benefit received by a representative teacher (i.e. pension (P) and Social Security (SS)) in relation to his/her wage (W). However the state's utility is limited by the individual's own preference (U_i) with respect to current income, i.e. his wage less the contribution to the state system (C_i),

as against retirement income. The inclusion of SS in the individual's utility function implies the appropriate adjustment of both current earnings and of retirement income for the existence of Social Security. Finally the state also derives utility from the production of other goods and services (X_o).

The relevant budget constraint is given by

(2) $B_s = \lambda C_s + Y_o X_o$

For our purpose the state budget (B_s) is assumed to be fixed. C_s is the current actuarial cost of the state contribution to pay for the increment to the pension promised for this years work. Since states have an option to fund their liabilities in many different ways and since different funding scheme may lead to different degrees of pressure on the current state budget, the cost of meeting a new liability resulting from enacting a pension law may be perceived differently by the legislators, depending on the funding scheme that has been adopted. Accordingly, C_s is adjusted by the parameter λ to indicate differences in the cost as it is actually perceived. The second expression in (2) represents the price (Y_o) and quantity (X_o) of other goods produced by the state.

The relation between pensions and contributions is as follows:

(3) $P = g(C_s, C_i)$

In (3) the pension of an individual teacher is determined in accordance with a function g which aggregates individual contributions, imputes a return on an assumption of a given interest rate and other actuarial characteristics, and prorates the pension to a typical individual.

From (3) we solve for C_s which is given by

(4) $C_s = g'(P, C_i)$

where g' is the appropriate inverse function of g.

Substituting (4) into the budget equation (2) we have

(5) $B_s = \lambda g'(P, C_i) + Y_o X_o$

Maximizing the state utility function (1) subject to the budget constraint (5) with respect to the three endogenous variables (P, C_i, X_o) we can generate three reduced form equations with these endogenous variables expressed as functions of the parameters of the functions (U_s, U_i and g') and of the variables W, B_s, SS, λ and Y_o. Our interest is only in the reduced form equation for pensions (P) and individual contributions (C_i).

As pointed out previously, the formulas are designed in such way that pensions will not exceed final average salary. We interpret this to mean that legislative preferences are constrained by what may be termed the concept of "maximum acceptable pension." In terms of our

model this means that, where such a constraint is operative, i.e. for those who have accumulated long periods of service, pensions may be related to the explanatory variables in a way different from situations where the constraint of the maximum acceptable pension does not apply.

The equations which we will estimate below are linear approximations of the reduced form equations for pensions and contributions. In view of what was said above about the constraint of maximum acceptable pensions we will compute pension benefit estimates for 25 and for 40 years of teacher's service, the assumption being that in the latter case the process of pension determination may be influenced by legislative reluctance to have pensions approach final average salary.[60] The independent variables in the reduced form equations will include both

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[60] The periods of 25 and 40 years seem to be reasonable representations of periods of moderate and lengthy years of experience. See for example, National Education Association, The American Public School Teacher 1965-66, Washington, D.C. 1967, pp. 12 & 37. Field work interviews also support this choice.

the exogenous variables mentioned explicitly in the discussion of the model and some additional variables which will act as proxies for the parameters of the state and individual utility function.[61]

IV

In the present section we describe the dependent variables--pensions and contributions and a set of independent variables that we use to test the implications of our model.

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[61] It will be apparent that in accordance with what was said above the model assumes that salaries are determined on a local level, i.e. from the viewpoint of the state they are exogenous. We recognize that salary determination on a local level may be, in fact, influenced by the state pension system. In such a case it would be appropriate to estimate the pension and contribution equations, implied by the model, using simultaneous equation techniques where the teachers' salaries are treated as an endogenous variable. In view of this possibility we will supplement our ordinary least square regressions with regression estimates using two-stage least squares. A more complex problem may arise if the state recognizes that its pension program may have an effect on salary determination on the local level and takes this into account in formulating its pension policy. A model required to analyze such behavior would have to incorporate, as an endogenous factor in the state's decision making with respect to pension, the process of salary determination on the local level. It seems doubtful, however, that when state legislatures formulate pension policies they give serious consideration to the effect of such policies on the process of local salary determination. And, in any case, the construction of a model of this type would call for a complete explanation of the process whereby both salaries and pensions are determined--a task beyond the scope of this paper.

Pensions (P). As we indicated previously we use the formula approach to estimate indices of pension benefits for teachers with 25 and 40 years of experience. The formulas that we use are applicable to teachers who have just joined the retirement system, i.e. the pension benefits are determined on the basis of the most recent provisions of the systems in individual states.

Contributions (C_i). The dependent contribution variable in our model is specified as an annual contribution made by individual teachers. As we already pointed out, we measure these contributions by applying state established schedules to the average salaries of the teachers covered by the retirement systems of each state.[62]

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[62] In a few cases the rate of contribution varied with age at the time of joining the system and with sex of the teachers. In such cases we assumed that the teacher joined the system at the age of 25, and we used the 1972-73 sex mix of the profession in each state.

Social Security (SS). The first independent variable (SS) pertains to Social Security. This is a dummy variable which takes on a value of 1 where Social Security coverage is available to teachers employed in a state; otherwise it takes on a value of 0.[63]

Since our model assumes that a state derives utility from an adequate retirement income of teachers, the implication is that the adoption of Social Security would reduce the role of the state system and have a negative effect on both pension benefits and individual contributions. One should bear in mind, however, that many teachers work for some period of time (both during the summer and after school) on jobs outside the public school system and thus may qualify for some Social Security benefits; and that

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[63]Social Security has been introduced in individual states under varying conditions. In most states where Social Security was adopted on a state-wide basis at least all the newly hired teachers were required to join the system. For those states the formulas that we used to compute pension benefits and contributions are applicable to the teachers who join Social Security. In eight of the 39 states in the sample Social Security was made available on a local option basis. In all of these eight states an overwhelming majority of teachers in fact, joined Social Security. In any case, in these states the same formulas apply to all teachers, whether they joined the system or not.

To be sure that the availability of Social Security on an optional basis had no different effect on pensions and contributions we estimated a number of regressions where the optional states were differentiated from those with Social Security required on a state-wide basis. The results indicated that the effect of Social Security were the same in both types of situations.

spouses of married teachers frequently work on jobs covered by Social Security.[64] Accordingly, the effect of the state system joining Social Security on the retirement income of teachers would be less than an analogous effect on a group with no initial coverage by Social Security. Therefore, in so far as the state pensions were already adjusted to the partial coverage by Social Security, one would expect that the state systems that joined Social Security would not reduce state pensions by the full amount of Social Security benefits.

Salary (W). On a priori grounds it is not obvious what the magnitude of the effect of salaries on pensions and contributions (and the implied elasticites) would be. For example, one possibility is that pensions and contributions will not vary significantly with average salary in the state. This would be the case if for the purpose of determining pensions the different state legislatures

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[64] For example, in the summer of 1965 38% of male teachers and 9% of female teachers held jobs outside of the public school system. During the school year 1965-66 22% of male and 4.6% of female teachers held such jobs. In addition, 65% of female teachers were married with 83% of their husbands employed on a full time basis. About 76% of these husbands worked on jobs outside of teaching. The American Public School Teacher, 1965-66, op. cit. pp. 33, 39, 40.

had the same view of what is a reasonable level of pensions--in dollar terms--for an average teacher in their states. Such behavior in the part of the legislatures, however, would be difficult to reconcile with the fact that within individual states the respective pension formulas generally call for higher pensions for those who earn relatively high salaries.

Another possibility is that taking into account individual preferences state legislatures determine pensions in a way that is generally consistent with the implications of the standard theory of consumer behavior. If the individual preferences are assumed to be relatively homogeneous, the elasticities of pensions and contributions with respect to salaries should be, ceteris paribus, close to unity. On the other hand, if time preferences are assumed to vary systematically with salary levels, their elasticities may be significantly different from one. This is the case in unionized construction where the results imply that the elasticity of pensions with respect to wages is, in fact, significantly greater than unity.[65]

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[65] A. L. Gustman and M. Segal, "Wages, Wage Supplements and the Interaction of Union Bargains in the Construction Industry," Industrial and Labor Relations Review January 1972 p. 182.

State Budget (B_s). The model suggests that one of the independent variables in the two reduced form equations should be an index of the budget constraint facing state legislatures. In the following analysis this index is measured by state current expenditures per capita. The presumption is that interstate variations in these expenditures provide, ceteris paribus, an indicator of interstate differences in willingness and ability to finance public goods.

State-Local Contributions to Pensions Funds (SF or SLF). The model presented above assumes that the entire employer, i.e. public contribution to the pension fund, is paid by the state. The state laws do, in fact, prescribe the size of such contributions. But in some states the payments are made only by the state, in others only by the school districts, and in still others these payments are shared by the state and the school districts. And even these distinctions are somewhat blurred since in some cases what is a local contribution may be financed by means of a special state tax, and what is a state contribution may be deducted from the allocation of state aid to individual localities.

These different methods of financing employer contributions have some implication for the process of pension determination as visualized by our model. Since payments by school districts are an additional source of

funds for financing employer contributions they relax the budget constraint facing the state. However, the fact that it is in the state's interest to limit the local tax burden tends to counteract this effect.[66] To take account of these considerations we include among the independent variables of our estimating equation two dummy variables. The first of these--SF--takes on a value of 1 if the employer contribution is financed only by the state; otherwise it takes on the value of 0. The second dummy variable--SLF--takes on a value of 1 if the state and the local districts share the employer contribution; otherwise it takes on the value of 0. Clearly, if both dummy variables take on a value of 0, the full burden of employer contribution is borne by the local authorities.

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[66] In terms of our model the factors mentioned above have the following implications:

1. For those states where a portion of or the entire employer contribution is financed by a local district the equation which relates pensions to contributions (Equation (3)) must be modified to reflect this fact. Equation 5--i.e. the final equation for the budget constraint--must also be modified accordingly.
2. The parameter λ in equations (2) and (5)--i.e. the perceived price of state liabilities--may be different in those states where the employer contribution is financed at least in part by local districts from that in the states where the cost of the entire contribution is borne by the state.
3. In view of the state's concern about the local tax burden the utility that it derives from teachers' pensions may be affected when employer contributions are financed at the local level. If this is so, Equation (1)--i.e. the equation for the utility function of the state--must be modified accordingly.

Teachers Retirement System (TRS). Our model presupposes that the teachers have a separate retirement system. In some states, however, teachers are covered by a state-wide retirement program that covers also other public employee groups. In such states both pension benefits and employee contributions of the various groups of public employees are likely to be strongly interdependent. The interdependence may affect the state budget relevant to the process of determination of teachers' pensions. And it may also influence the legislatures' view of what is a reasonable formula for linking teachers' pensions, contributions and salaries (i.e. the form of the state's utility function).

It is not obvious on a priori groups whether teachers will be better off in a separate retirement system or in one that includes other public employees. If the teachers wield more influence in legislatures than other employees, they might gain better pensions under conditions where there is less interdependence among the benefits and contributions of the various groups of employees. But if they are less influential than other public employees, they may actually benefit from being included in a state-wide retirement program.

To take into account the fact that where teachers have a separate retirement system their pensions and contributions may be different from those in the states where

teachers and other public employees are covered by the same system, we include as one of our independent variables an appropriately defined dummy variable. This variable takes on a value of 1 for those states that have a separate retirement system; otherwise it takes on a value of 0.

Median Age of Teachers (AGE) and Proportion of Teachers who are Female (FEM). Both the states' and individuals' assessment of the relative importance of pensions--and therefore the corresponding utility functions--may depend on the demographic characteristics of the potential retirees. Of these the most important appear to be the teachers' age and their sex composition. These two characteristics may also influence the way in which state legislatures perceive the cost of pensions.

On a priori grounds it seems reasonable to assume that the older the average teacher the greater will be the importance attached by both legislatures and individuals to the provision of adequate pensions. However if the retirement systems are not fully funded an older teachers work force implies a shorter period to the time when unfunded liabilities become due. Under such conditions the perceived cost of pensions (i.e. the value of λ) in equation (5)) may be higher for an older teachers work force than for a younger one. To measure the influence of teacher's age on pensions and contributions we include as one of our independent variables the median age of teachers in each state.

The effect of sex composition (measured in our estimating equation by the proportion of females among the teachers) is also not obvious on a priori grounds. In the first place this effect may depend on the stereotype image the legislatures have of a retired female teacher. If the legislatures view such a retiree as a single person paternalistic considerations may lead them to provide a relatively high level of pension benefits and also possibly require relatively high contributions. But, if female teachers are viewed as essentially secondary workers, this view may lead to relatively less concern about the level of pensions and a correspondingly low level of contributions. In the second place, sex composition may have an effect on the relative cost of pensions. Since life expectancy of women exceeds that of men, the higher the proportion of women the larger the cost to the state of providing a given level of benefits, and this may lead to lower pensions. Proportion of women in the work force may also affect costs because of differences in turnover between men and women, and the fact that non-vested state contributions made on behalf of teachers who leave the system may be used to finance benefits for those who remain.[67]

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[67] In general, females are less firmly attached to the labor force and for this reason one would expect greater turnover among female than among male teachers. However this may be offset by the fact that male teachers are likely to have more occupational opportunities outside of teaching than females and this may increase their turnover.

Strength of Collective Bargaining (NEG) and Legal Framework (LAW). The legislative policy toward pensions is likely to be affected by the overall political environment in the state. As indicated previously, through their lobbying at a state level teachers' organizations constitute a factor shaping this environment. It is reasonable to assume that the effectiveness of these organizations--i.e. essentially their influence on the state's utility function--depend on their strength in individual states. To measure strength of teachers' organizations we use as an independent variable NEG the proportion of teachers covered by state pension plans who are also covered by negotiated agreements with local school boards.

As another indicator of political environment related to legislative preferences we include as an independent variable an index that is designed to measure state legal requirements for recognition of and bargaining with teachers' organizations. Such an index was constructed by T. A. Kochan in the context of constructing a more general index of state laws pertaining to collective bargaining in the public sector.[68] The Kochan index is an ordinal one, with increases in its value implying a more

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[68]Thomas A. Kochan, "Environmental Correlates of Public Sector Bargaining Laws," Industrial Relations, October 1973, pp. 322-35.

formal and more comprehensive legal framework within which collective bargaining with teachers operates within each state. In practice, increases in this index imply a relatively more supportive environment for achieving the goals of teachers' organizations.

The Price of Pensions (λ) and The Price of Other Goods and Services (Y_o). As can be seen from the preceding discussion, a number of the independent variables--SF, SLF, TRS and also AGE and FEM--bear some relation to the price of pensions as perceived by state legislatures (λ). However, the most important systematic factor affecting λ, i.e. the funding scheme adopted in the course of enacting a pension law, cannot be readily quantified. As a result we have no way of introducing a direct measure of the perceived cost of pensions.

Another variable suggested by the model--the price of other goods and services bought by the state (Y_o)--could not be included because an appropriate price index by state is not available. The omission of a direct measure of λ and of Y_o undoubtedly produces some bias in the coefficients to be estimated for the included variables. The direction of that bias is not obvious on a priori grounds.

Adjustment for Post-retirement Increase (ADJ). The measure of pensions which we use in the first of our estimating equations does not fully reflect, for all of the states, the value of pension benefit that may be reasonably expected. The reason is that some of the states make periodic adjustments in the pension benefits of those already retired. Some of these adjustments are automatic, frequently related to changes in the cost of living; other adjustments may be made on an *ad hoc* basis. In order to take these adjustments into account, we include in the estimating equation for pensions a dummy variable (ADJ) which takes on a value of 1 if the data for a given state indicate either provisions for automatic adjustment or recent pension increases for those already retired; otherwise the variable takes on the value of 0.

Since the rate of contribution may be designed to reflect the existence of a post-retirement adjustment, ADJ is also included as an independent variable in the estimating equation for contributions.

V

The estimating equations discussed in the preceding pages are:

$$(6)\quad P = a_1 + b_1 SS + c_1 W + d_1 B_s + e_1 SF + f_1 SLF + g_1 TRS + h_1 AGE + i_1 FEM + j_1 NEG + k_1 LAW + l_1 ADJ$$

$$(7)\quad C_i = a_2 + b_2 SS + c_2 W + d_2 B_s + e_2 SF + f_2 SLF + g_2 TRS + h_2 AGE + i_2 FEM + j_2 NEG + k_2 LAW + l_2 ADJ$$

where the dependent variables are:

P = pension computed on the assumption of 25 or 40 years of service.

C_i = annual contribution made by a teacher covered by the state retirement system.

The independent variables are:

SS = dummy variable with a value of 1 in states where Social Security is available to teachers; otherwise the value is 0.

W = average salary for the teachers covered by the pension system.

B_s = state budget constraint.

SF = dummy variable with a value of 1 in states where the employer contribution is paid only by the state; 0 otherwise.

SLF = dummy variable with a value of 1 in states where the employer contribution is shared by the state and by local districts; 0 otherwise.

TRS = dummy variable with value of 1 in states where teachers have a separate retirement system; 0 otherwise.

AGE = median age of teachers.

FEM = proportion of teachers who are female.

NEG = proportion of instructional staff in the pension system covered by neogitated agreements.

LAW = index of state requirements for recognition of and bargaining with teachers' organizations.

ADJ = dummy variable with a value of 1 in states where there are provisions for automatic adjustment of pensions or where there have been recent adjustments; 0 otherwise.[69]

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[69]The sources for the data are as follows: SS, SF, SLF, TRS and ADJ from National Education Association, Teacher Retirement Systems, 1974; W from National Education Association, Twenty Sixth Biennial Salary and Staff Survey of Public-School Professional Personnel 1972-73, NEA Research Report 1973-R5; P, C_i from the two sources above; B_s from Bureau of the Census, Governmental Finances in 1972-73; AGE from U.S. Department of Commerce, Census of Population 1970, Detailed Characteristics, #2-52, Tables 173 and 174 and from National Education Association, Twenty Fifth Biennial Salary Survey of Public-School Professional Personnel, 1970-71, Volume I. FEM from National Education Association, Estimates of School Statistics 1970-71 Research Report 1970-R15, Table 5 and Census of Population, 1970 Detailed Characteristics, #2-52. Table 173 and from National Education Association, Twenty Fifth Biennial Salary Survey of Public-School Professional Personnel, 1970-71, Volume 1. NEG from National Education Association, Negotiation Research Digest, June 1973, volume 3, #10, Table D-1; and National Education Association, Estimates of School Statistics, 1973-74, Table 5; LAW from Thomas A. Kochan, "Environmental Correlates of Public Sector Bargaining Laws," Industrial Relations, October 1973.

In those cases where particular information was not available in the cited source we obtained supplementary information from other published sources, from the Washington office of the National Education Association and from the offices in charge of the pension systems of individual states. Further details of our methodology are in Appendix B.

The results of our empirical analysis are presented in Table 15.[70] These results are consistent with the basic assumptions of our model, i.e. that while the state derives utility from providing pensions for teachers, in setting up a pension system it also takes into account the utility preference of individual teachers. As can be seen, the signs on the variables are generally consistent with our expectations; all the variables but two (B_s and SF) have coefficients that suggest statistically significant relation in either a pension equation, the contribution equation or in both; and, for a cross-section study of this kind, the $\bar{R}^2$'s are reasonably satisfactory.

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[70] We also computed versions of the equations presented in Table 15 using, instead of average salary for teachers covered by state pension plans, the salary in the 75th percentile of all teachers employed in each state. Because of lack of data we are unable to compute the 75th percentile salary for only those teachers covered by state systems, i.e. a salary measure that excludes teachers' salaries in several major cities that have their own retirement systems. Nevertheless, given the possibility that retiring teachers may be getting salaries that exceed average salaries of those covered by state systems, we felt that such a computation will be of interest. In fact, it turns out that the results of the regression using this alternative salary variable parallel closely the results reported in Table 1.

The first variable to be considered is SS--the Social Security variable. This variable has a significant and, as expected, a negative effect on both pensions and contributions. Specifically, availability of Social Security to teachers lowers pensions computed on the basis of 25 years of experience (P- 25) and those computed on the basis of 40 years (P- 40) by $1385 and by $1926 respectively. The size of these reductions is well below the amount of Social Security benefits which would be currently received by a typical retired couple in the income bracket of an average teacher. As stated previously, in so far as the state pensions in the states where Social Security is not officially available to teachers have been adjusted to take into account partial Social Security coverage of many teachers, this is the expected result. The analogous reduction in individual contribution is $220. Since the average values of P- 25 and P- 40 are $3975 and $6109 respectively and the average contribution is $515, the effect of SS is to reduce contributions proportionately more than pensions.[71]

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[71]These results show that making Social Security available has an effect of raising, from the viewpoint of the individual teacher, the benefit-cost ratio of state pension systems. This does not mean, however, that official availability of Social Security necessarily improves the teachers' status in terms of total costs and benefits of post-retirement income. To answer the question of whether the teachers' status is improved one would need measures of the value of the benefit-cost ratio (cont.)

Table 15

Empirical Results*

	Dependent Variables		
	P-25 (25 years of service)	P-40 (40 years of service)	C_i
SS	-1385 (-6.73)	-1926 (-6.99)	-219.7 (-5.99)
W	.4173 (3.18)	.6862 (3.90)	.0651 (2.78)
B_s	.3543 (.26)	-1.912 (-1.05)	.1447 (.60)
SF	151 (.74)	164.7 (0.6)	-25.37 (-.70)
SLF	383 (1.37)	820.7 (2.19)	81.99 (1.64)
TRS	276 (1.57)	510.1 (2.16)	76.25 (2.43)
AGE	129 (2.07)	123.2 (1.48)	16.26 (1.47)
FEM	71.26 (2.91)	74.96 (2.29)	-4.833 (-1.10)
NEG	17.22 (2.18)	11.51 (1.09)	-.5196 (-.37)
LAW	4.00 (.26)	4.746 (0.23)	-6.607 (-2.41)
ADJ	-386 (-1.65)	-784.0 (-2.50)	73.91 (1.77)
Intercept	-9528 (-2.84)	-8614 (-1.92)	-280.6 (-.47)
$\bar{R}^2$ (Standard error)	.7993 (493.2)	.8074 (659.9)	.7195 (87.81)

*t-statistics in parentheses.

The findings with respect to the relations between pensions, contributions and the second independent variable--salaries (W)--are statistically significant and generally consistent with the implications of the standard theory of consumer behavior--i.e. that differences in salaries are reflected in roughly proportional differences in retirement benefits and contributions.[72] The elasticities of P-25, P-40 and C_i with respect to salaries are .99,

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of the state systems and of Social Security. Indeed in the case of Social Security one would need the benefit-cost ratio of an extension of coverage to teachers who, for reasons indicated previously, already have partial coverage. Our model, designed to explain interstate variation in pensions and individual contributions, does not call for data which would be necessary to compute the levels of such benefit cost ratios. Accordingly the results of our regressions cannot throw light on the question of whether the introduction of Social Security improves teacher status in terms of costs and benefits of their post-retirement income. It is relevant to note here that any comparison of costs and benefits of the state system and of Social Security would have to go beyond more computations of total employee contribution and total pensions. For example, in view of the turnover in the teaching profession, coverage by Social Security may provide a firmer guarantee of retirement income than is available under a state system.

[72] As we noted above (fn. 61) there is some possibility that salaries established at a local level will be influenced by the nature of the state pension system. To take account of this possibility we estimated versions of the pension and contribution equations using two stage least squares where the salary variable is treated as endogenous. In addition to the exogenous variables described in the text a set of exogenous variables for the salary equation was adopted from M. O. Clement and A. L. Gustman, Factor Cost Differences, Educational Equality, and Funding Decisions in Public Education, (cont.)

1.05 and 1.19 respectively. An elasticity greater than unity is consistent with the kind of tax advantages inherent in our tax system that are described by Rice.[73]

As indicated in the previous discussion, we had no firm expectations with respect to the impact of the SF and SLF variables on the size of pensions and contributions. The results suggest that there is something of a tendency toward higher pensions in those states where the employer contribution is shared by the state and by the local governments but only in the P-40 equation is the SLF coefficient significant at a conventional level. The coefficient on SLF in the contribution equation is positive but not significant.

Report to National Institute of Education, Project No. 2-0681, March 1975. Coefficients estimated for all but the endogenous salary variable were identical for 2SLS and OLS versions of each equation. As the theory would lead one to expect, the 2SLS estimate of the coefficient on the salary variable exceeded the OLS estimate for each of the pension equations. Also in accordance with the theory, the 2SLS estimate of the salary coefficient in the contribution equation was smaller than in the OLS equation. (See J. Bronfenbrenner, "Sources and Size of Least-Squares Bias in a Two-Equation Model," Studies in Econometric Method, eds. W. C. Hood and T. C. Koopmans, New York, 1963).

[73] Rice op. cit.

The results pertaining to TRS indicate that there is a tendency for teachers pensions and for contributions to be higher in the states where their pension systems are set up on a separate basis, i.e. where they are not linked formally with those of other employees. However, while under such institutional arrangements pensions are higher (in terms of average pension for the sample) by about 7-8 percent, the yearly contributions are higher by a larger percentage, i.e. by about 15 percent. It appears thus that the teachers may be getting a better deal, at least in relative terms, where their pension system is combined with that of other public employees in the state.

The coefficients on AGE and FEM suggest that preferences of state legislatures are systematically affected by age and sex composition of the teachers work force. Among the 39 states pensions vary positively with the average age of teachers and with the proportion of women in the work force. The elasticities in P-25 with respect to age and proportion of women are 1.20 and 1.22 respectively; in P-40 the respective elasticities are .75 and .83 but the coefficient on the AGE variable is not significant. The fact that the elasticities in the P-25 equation exceed those in the P-40 equation and, indeed, the fact that AGE is not significant in

P-40 may reflect the influence of the previously discussed concept of "maximum acceptable pension." In other words, the view that pensions should be less than final average salary may tend to mitigate the effects of teachers' age and sex composition on legislative preference. As can be seen in Table 1, in the contribution equation neither the AGE nor the FEM coefficient is statistically significant.

The NEG variable is significant in the P-25 equation and indicates that the effect of teachers' organizations on pensions may be quite important. The potential importance of this effect can be measured by predicting from the regression equation, assuming average values of the other independent variables, the pensions that would be received under conditions of a 100% and a 0% coverage by negotiated agreements within a state. The pensions that would be received under a 100% coverage would be 54% greater than those received under 0% coverage. Among the 39 states in the sample coverage by negotiated agreements ranges from zero to 88% of the teachers. Thus the maximum difference in pensions attributable to the effect of teachers' organizations is about 48%.

In contrast to the above, the coefficient on NEG in the P-40 equation is not significant. This is consistent with our previous discussion about the limitations

on the size of pensions resulting from the concept of a maximum acceptable pension. Specifically, while teachers' organizations may be a major factor in raising pensions where the pensions constitute 40-50% of final average salary, they may encounter considerable resistance when pensions--which after all in 70% of cases are augmented by Social Security--account for two thirds or more of such a salary.

There are also other factors that may explain the differences in the effectiveness of teachers' organizations on the pensions of teachers with 25 and 40 years of service. To the extent that such organizations are guided by egalitarian considerations they are likely to be more concerned about those teachers whose pensions will constitute a relatively small proportion of their salary. In addition, teachers' organizations have shown strong and growing interest in early retirement. An obvious way of making early retirement more attractive is to raise relatively the pensions received by those with less than maximum years of service.

Judging from our results, teachers' organizations have not had a significant effect on individual contributions to the pension funds. While the coefficient on NEG in the contribution equation is negative, it is very small and not significant. This situation, however,

appears to be changing. Some of our field work interviews indicate that, apparently as a result of the efforts of teachers' organizations, a few states have recently placed their pension system on a noncontributory basis.

It may be helpful to use some very rough estimates of the cost of pensions to put our findings with respect to the impact of teachers' organization on pensions of teachers with 25 years of experience in a broad perspective. As pointed out before, the current employer contributions do not provide a measure of the actual costs of the currently promised pension benefits. For the purpose of illustration, however, let us assume that in the unorganized states the current cost (including employee contribution of the promised pension benefit constitutes 10 percent of the annual salary. Given this assumption, our results suggest that in the extreme--i.e. if teachers are fully covered by negotiated agreements--current pension costs might be raised to 15 percent of the annual salary. In other words, in the extreme, the effect of teachers' organizations may be to increase benefits by an amount equal to 5 percent of the salary. Such an increase corresponds roughly to what has been estimated as the effect of teachers'

unions on teachers' salaries.[74] The implication is that in terms of total annual employment cost the effect of teachers' organizations on pensions may be, roughly, as important as the analogous effect on salaries.

As indicated previously the LAW variable, in effect, reflects the degree to which the legal environment of individual states is supportive of collective bargaining by public school teachers. Our results indicate that in those states where the LAW variable has high values teachers' contributions to the funds are significantly lower than in the states with a less favorable legal environment. This variable, however, is not significant in the pension equations.

The results pertaining to ADJ indicate that in those states where pensions are supplemented by post-retirement adjustments, the pensions determined by state formulas are lower and the individual contribution higher. These results seem to be quite reasonable.

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[74] See, for example, H. Kasper, "Reply," Industrial and Labor Relations Review, April 1972, p. 423. We should not be particularly surprised by the fact that teachers' organizations have a proportionately greater impact on pensions than on salaries. An important reason is that teachers' organizations have lobbied on the state level for years; in contrast, they have been bargaining collectively for salaries for a relatively short time.

Finally, we should note that one variable directly suggested by our model--B_s--is not significantly related to either pensions or contributions. One reason for this may be that the B_s variable--pertaining as it does to state budgets--does not reflect fully the relevant budget constraint since in almost half of the states localities are responsible--at least formally--for some of the employer contributions to pension funds.[75] In addition in the six of the 39 states where employer costs are shared by state and local governments the relative shares of the two governments vary among the states at any point of time, and the division of responsibility changes over time. Given the previously mentioned problems of computing the cost of pension systems, it is not possible to obtain reliable estimates of the shares of the cost borne by the states and localities. There may be also other reasons, including the possibilities of measurement error, of the effects of the omitted variables, or of the fact that our simplifying assumption that the state budget is fixed is inappropriate. While

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[75] As pointed out in footnote 66, the fact that in many states localities pay for at least part of the cost of pensions would have to be reflected in several modifications of the original model.

one could deal with this last possibility by building a tax function into our model,[76] we believe that such a procedure would complicate the analysis with little likelihood that it would add importantly to our findings.

IV

A number of points emerge from the discussion and analysis of this paper:

1. A useful measure of interstate variations in pensions of public school teachers can be derived from the available state formulas for pension benefits. In view of the considerable differences among the states in funding and actuarial practices it would not be appropriate to derive such a measure from the data on employer contributions.

2. A relatively simple model which assumes that state legislatures derive utility from providing adequate pension benefits for retired public school teachers appears to provide a reasonably satisfactory explanation of interstate variations in the measure of pensions and individual contributions.

3. The results of regressions suggested by this model indicate that, ceteris paribus, at a given moment of time pensions vary among the states in a way roughly proportionate to teachers' salaries.

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[76] For an example of an analysis that incorporates a tax function see W. W. McMahon, "An Economic Analysis of the Major Determinants of Expenditures in Public Education," Review of Economics and Statistics, August 1970.

4. The empirical findings also indicate that, ceteris paribus, official adoption of Social Security reduces pension benefits and contributions under the state system. In so far as the partial replacing of state pensions by Social Security does not affect other kinds of savings, the official adoption of Social Security is likely to reduce overall savings. The reason is that, on the average, the state systems are much more fully funded than Social Security.

5. Finally, our results provide an indication of the importance of teacher organizations in influencing the size of state pensions. Specifically, they indicate that the efforts of these organizations increase considerably the pensions of those teachers who retire after 25 years of service. In contrast, it appears that these organizations have little impact on the pensions of teachers who have accumulated long periods of service, i.e. those whose pensions, computed on the basis of state formulas, would approach the levels of their final salaries.

Appendix A

We are listing below the central city school districts which constitute our sample for the 1972 and 1960 regressions pertaining to the various measures of teachers' salaries. In both years we used all the central city districts drawn from the largest eighty five SMSA's for which the relevant data were available. For 1972 we could use 93 such districts; for 1960 only 84. We excluded Washington, D.C. because of its special and unique characteristics with respect to school financing and other relevant aspects. The list for 1972 is as follows:

Mobile Co., Alabama
Pheonix, Arizona
Anaheim, California
Garden Grove, California
Santa Ana, California
Fresno, California
Los Angeles, California
Long Beach, California
Sacramento, California
San Bernardino, California
Ontario, California
San Diego, California
Oakland, California

San Francisco, California

San Jose, California

Denver, Colorado

Bridgeport, Connecticut

Hartford, Connecticut

New Haven, Connecticut

Wilmington, Delaware

Broward Co., Florida

Duval Co., Florida

Dade Co., Florida

Orange Co., Florida

Hillsborough Co., Florida

Pinellas Co., Florida

Atlanta, Georgia

Chicago, Illinois

Gary, Indiana

Indianapolis, Indiana

Kansas City, Kansas

Wichita, Kansas

Louisville, Kentucky

New Orleans, Louisiana

Baltimore, Maryland

Boston, Massachusetts

Springfield, Massachusetts

Worcester, Massachusetts

Detroit, Michigan

Grand Rapids, Michigan

Minneapolis, Minnesota

St. Paul, Minnesota

Kansas City, Missouri

Omaha, Nebraska

Jersey City, New Jersey

Paterson, New Jersey

Albany, New York

Schenectady, New York

Buffalo, New York

New York City, New York

Rochester, New York

Syracuse, New York

Rome, New York

Mecklenburg Co., North Carolina

Greensboro, North Carolina

Forsyth Co., North Carolina

High Point, North Carolina

Akron, Ohio

Canton, Ohio

Cincinnati, Ohio

Cleveland, Ohio

Columbus, Ohio

Dayton, Ohio

Youngstown, Ohio

Warren, Ohio

Toledo, Ohio

Oklahoma City, Ohlahoma

Tulsa, Oklahoma

Portland, Oregon

Allentown, Pennsylvania

Harrisburg, Pennsylvania

Philadelphia, Pennsylvania

Pittsburgh, Pennsylvania

Providence, Rhode Island

Knoxville, Tennessee

Memphis, Tennessee

Nashville, Tennessee

Beaumont, Texas

Port Arthur, Texas

Dallas, Texas

El Paso, Texas

Fort Worth, Texas

Houston, Texas

San Antonio, Texas

Salt Lake City, Utah

Norfolk, Virginia

Portsmouth, Virginia

Richmond, Virginia

Seattle, Washington

Everett, Washington

Tacoma, Washington

Milwaukee, Wisconsin

In our 1960 regression we had to exclude the following from the above list: Anaheim, California; Garden Grove, California; Santa Ana, California; Kansas City, Kansas; Greensboro, North Carolina; Forsyth Co., North Carolina; High Point, North Carolina; Fort Worth, Texas; Everett, Washington.

Appendix B

This appendix provides supplementary material pertaining to the analysis of the determinants of pensions of public school teachers. Specifically, it describes in some detail the way in which we derived each of the variables in our estimating equations.

P-25. This variable constitutes an index of the pensions paid to individual teachers employed in different states. It is computed for an individual who becomes employed as a teacher in a relevant state in 1973 and retires twenty-five years later.

As pointed out in the text, teachers' pensions are based on formulas which use the concept of Final Average Salary (FAS). As an index of FAS--where it is computed as an average salary in the last 3 years before retirement--we use the average 1973 salary of all the teachers covered by the state pension system in a given state (the computation of such average salaries is discussed below). We assume that a teacher's salary increases at a rate of 3% per annum and we use this assumption to derive FAS in those states where it is computed over a period other than 3 years. Specifically, in order to obtain an FAS from the average 1973 salary of all the teachers covered by a state system we multiply the latter

measure by the following factors:

FAS computed over 2 years = 1.0147

FAS computed over 3 years = 1.0000

FAS computed over 4 years = 0.9856

FAS computed over 5 years = 0.9714

The state formulas for computing pensions are in National Education Association, Teacher Retirement Systems, 1974.

P-40. This variable constitutes an index of the pensions paid to individual teachers employed in different states. It is computed for an individual who becomes employed as a teacher in 1973 and retires forty years later. The computations of P-40 are analogous to those of P-25.

C_i. This variable constitutes an index of employee contributions made by teachers covered by state pension systems. The formulas for computing employee contributions are in National Education Association, Teacher Retirement System, 1974. To compute C_i we apply these formulas to the average 1973 salaries of all the teachers covered by the state pension system of individual states.

In three states--New Hampshire, New Jersey and Vermont--employee contributions depend on the age at which the individual joins the system and on the individual's sex. We assumed that all individuals join the pension system at the age of 25, and we used the actual sex ratios of the teachers

employed in these states in the 1972-73 school year as weights to compute C_i. (The data on male-female employment are in National Education Association, Estimates of School Statistics, 1973-74, Research Report R-8, Washington, D.C. 1974).

SS; SF; SLF; TRS; ADJ. The source of these dummy variables is National Education Association, Teacher Retirement Systems, 1974.

W. This variable represents the average 1972-73 salary of those teachers in each state who are covered by the state pension system. In several of the 39 states covered in the study major cities have their own pension systems for teachers. These cities are as follows:

Colorado--Denver

Delaware--Wilmington

Georgia--Atlanta

Illinois--Chicago

Kansas--Kansas City

Massachusetts--Boston

Michigan--Detroit

Minnesota--Duluth
Minneapolis
St. Paul

Missouri--Kansas City
St. Louis

Tennessee--Knoxville

Memphis

Wisconsin--Milwaukee

The source of the state salary data and for the number of teachers by state is National Education Association, Estimates of School Statistics, 1973-74, Research Report 1973-R8. In excluding the cities with their own pension systems we used the following formula:

$$W = \frac{(W_s)(T_s) - (W_c)(T_c)}{(T_s - T_c)}$$

Where W_s = Average salary in the state

T_s = Number of teachers in the state

W_c = Average salary in the city with its own pension plan

T_c = Number of teachers in the city with its own pension plan

The data for W_c and T_c are from National Education Association, 26th Biennial Salary and Staff Survey of Public School Professional Personnel, 1972-73, Research Report 1973-R5, except for the data for Chicago, Duluth, St. Paul, Wilmington, Atlanta, Kansas City, Kansas and Knoxville. For the first six of these cities the salary was estimated by multiplying the 1972-73 value for W_s by the ratio of $\frac{W_c}{W_s}$ for 1970-71. The data for W_c for 1970-71 are from National Education Association, 25 Biennial Salary Survey of Public School Professional Personnel (1970-71), vol. 1, Report 1971-R5. W_s for 1970-71 is from

National Education Association, Estimates of School Statistics, 1970-71, Report 1970-R15. For Knoxville we had to use the 1968-69 data and adjust them as described above. The estimates of T_c for 1972-73 are from unpublished data collected by the National Educationa Association except for Chicago where it came from the U.S. Office of Education.

B_s. This variable is represented by direct general expenditures (other than capital outlays) of each state government for all purposes per capita, 1972-73. All intra-governmental transfers are excluded. The source is Bureau of the Census, Governmental Finances 1972-73, Washington, D.C. 1974.

AGE. This variable represents the median age of teachers covered by the state systems. The data for median age are from Census of Population 1970, Detailed Characteristics No. 2-52. The numbers of teachers are as described under W.

FEM. This variable measures the proportion of teachers who are female. The source is as above under AGE.

NEG. This variable measures the proportion of the professional instructional staff covered by the state pension system that is represented by a teachers' organization for the purpose of conducting negotiations in the school year 1972-73. The source for the number represented is National Education Association, Negotiation Research Digest, June 1973, vol. III. For the total number of instructional staff in the state the source

is National Education Association, Estimates of School Statistics, 1973-74. The data were adjusted to exclude the cities with independent pension systems. Estimates for the number of instructional staff in these cities were calculated by multiplying the number of teachers in each city in 1972-73 by the ratio of the total number of instructional staff in the state to the total number of teachers in the state for that year. Data for the number of teachers are from the sources indicated in the discussion of the salary variable W. LAW. The source of this variable is Thomas A. Kochan, "Environmental Correlates of Public Sector Bargaining Laws" Industrial Relations, October 1973.